

Floods, Worms, and Cattle Plague:

Nature-induced Disaster at the Closing of the Dutch Golden Age,
1672-1764

By

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Abstract

The Golden Age of the Dutch Republic was waning by the end of the seventeenth century. The dramatic economic growth and cultural efflorescence that had defined this era was stagnant. The catastrophic “disaster year” of 1672 was a watershed event that revealed the Republic’s increasing fragility. It also signaled the beginning of an era of nature-induced disaster. Between 1672 and 1764, environmental catastrophes repeatedly tested Dutch cultural, technological, and economic resiliency. The four most dramatic nature-induced disasters included a massive coastal flood in 1717 that devastated communities across the North Sea coastal region, an infestation of invasive mollusks (shipworms) into the wooden components of sea dikes in the 1730s, and two outbreaks of cattle plague (1713-20; 1744-1764) that decimated herds in the Netherlands and across Europe. Dutch religious figures, government officials, technocrats, and the public wrestled with the meaning and consequences of these disasters in the context of Dutch decline. This dissertation argues that nature-induced disaster was a central element in the decline of the Dutch Republic. For contemporaries, disastrous events reflected increasing cultural and moral anxieties about the decay of this once-dominant European power. Disaster events also created social and economic instability that amplified the cultural resonance of these traumas. The repeated disasters of the period between 1672 and 1764 compounded these effects.

Decline was far from homogenous, however. Disasters tested Dutch resiliency, but they also sparked introspection and innovation. Nature-induced disaster prompted reappraisal and redesign of institutional, technological, and medical strategies to manage and control environmental vulnerabilities. They also prompted providential reassessments of the ultimate cause and meaning of these events. Four case studies evaluate catastrophic disaster events that

occurred between 1672 and 1764, highlighting the contingencies and continuities that shaped Dutch interpretation and response. Ideas about natural change mirrored shifting environmental realities as the seemingly novel, or uniquely devastating condition of disasters during this era conditioned Dutch moral, technological, and medical reactions.

Disasters were also long-term processes. They were the cumulative outcome of long-standing natural and cultural relationships. Disasters often underscored increasing disequilibria in Dutch relationships between a changing environment and their cultural and social systems of control. Contemporaries conceptually integrated multiple disaster episodes into a longer period of disaster that lasted from 1672-1764. The repeated nature-induced catastrophes during this post-Golden Age era of disaster entered into a conjuncture of economic, cultural, and climatic disasters that created a devastating and deadly synergy. The cumulative and compounding nature of this synergy was a significant factor in Dutch Golden Age decline.

Keywords: Natural disaster, environmental history, Netherlands, Dutch Republic, Golden Age, eighteenth century, seventeenth century, Teredo navalis, coastal flood, rinderpest, Dutch decline

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Chapter 1.

Decline Reconsidered: An Environmental History of Dutch Disaster

“Decline was thought to be total, on all levels, in all human endeavor-moral, economic, social, cultural, political” – E.H. Kossmann, 1992

“Gods hand has many times driven the horse of war, through water, fire and bullets, through disease and opposition; the fruitful Netherlands is threatened with decline...” – Wijnandus van Assen, 1732¹

1672 was a disastrous year for the United Provinces of the Netherlands. After successfully defending its borders against foreign invasion for over a century following their revolt against Habsburg Spain, the Dutch Republic seemed primed to fall. The combined forces of Louis XIV of France, King Charles II of England, and the bishops of Munster and Cologne had invaded the Netherlands from multiple directions. (Figure 1.1) The bishop of Cologne invaded from the south while the Bishop of Munster surged across the northeastern border and laid siege to the Dutch city of Groningen. A combined Anglo-French fleet attacked from the sea, blocking ports and trade, and threatening the western Maritime Provinces. The French king invaded from the east with a force of over 120,000 men. He quickly overwhelmed the smaller Dutch army that protected the borderlands, conquering the eastern provinces, Limburg, and by the summer of 1672, the central city of Utrecht. By early June, the governing assembly of Holland (called the *Staten van Holland*) issued the order to flood the countryside from the Zuiderzee east of Amsterdam to the Merwede River in southern Holland, in effect, conceding the

¹ Unless otherwise indicated, all Dutch translated into English by the author.

east of the country.² The Dutch had institutionalized military inundations due to their success in the sixteenth century defending the northern Netherlands against Spanish forces. By the late seventeenth century, Dutch military plans included a series of fortresses that defended sections of the flooded areas (called the *waterlinie*). Flooding, ordinarily an enemy seemed in this case a possible ally. Unfortunately, several months of drought reduced the available river water, limiting its effectiveness.

² See Figure I. Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen: 1575-1675*, 6 vols., vol. 4 (Franeker: Van Wijnen, 2000), 642-655; M.K.E. Gottschalk, *Stormvloeden En Rivieroverstromingen in Nederland* (Amsterdam: Van Gorcum, 1977), 239-243.

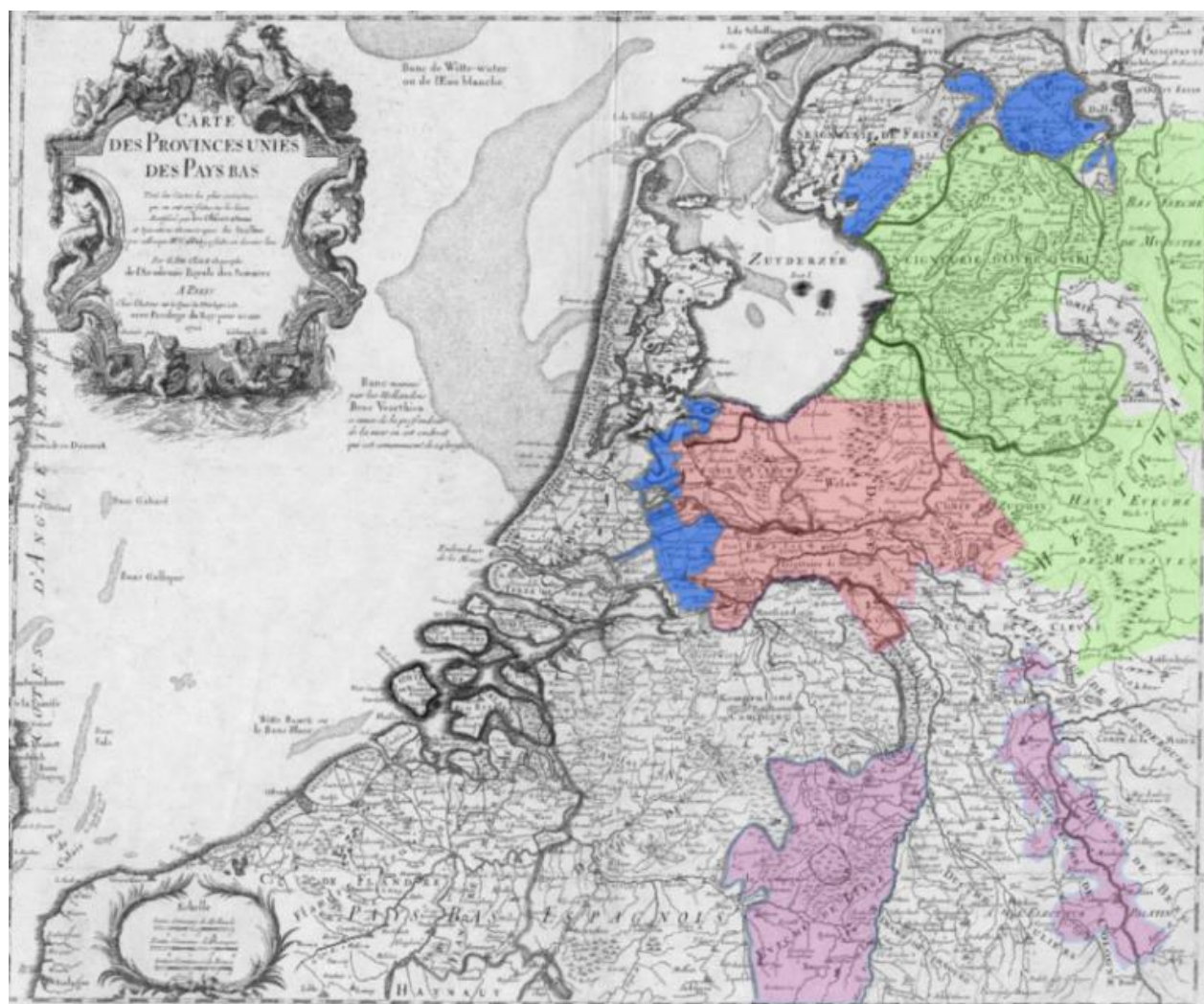


Figure 1.1. The United Provinces during the *Rampjaar*. The colored areas indicate the furthest extent of the armies of France (red), Munster (Green), and Cologne (purple). The Dutch purposefully inundated parts of their landscape (called the *waterlinie*) (blue) to halt or slow the enemy advance and it was a critical defense in 1672. Base map: *Provincies Unies des Pays Bas*, 1702, Guillaume DeLisle.

The shock of the attack and the success of the enemy advance resulted in dramatic social and political instability. An angry mob violently unseated Holland's chief statesman, *raadpensionaris* Johan de Witt, later killing (and cannibalizing) both him and his brother. Citizens rioted in cities throughout the Netherlands, looting houses and attacking the regents they deemed responsible for the defeats. By July, the Dutch Republic had lost its leadership and control of two-thirds of its land area. The Dutch refer to 1672 as the *rampjaar* (disaster year) –an apt characterization of the desperate social and political position of the Dutch populace for much of the year. Indeed, historians often characterize the *rampjaar* as *radeloos* (desperate), their government as *redeloos* (irrational), and the country itself *reddeloos* (irretrievable).³ The *rampjaar* was a crisis event of dramatic and revolutionary consequence.

The *rampjaar* was devastating because it was such a reversal of fortune. Between the late sixteenth century and the *rampjaar*, the Dutch Republic experienced its “Golden Age.” The Netherlands in the seventeenth century was a vital, vibrant international center of global trade and the entrepôt of Europe. The Golden Age birthed the Dutch East India Trading Company (VOC), the first stock market, and the first “modern economy.”⁴ Dutch society was oligarchic, pluralistic, and strongly divided in politics and religion, but it nevertheless nurtured giants in European art, science, and philosophy. This was the era of Rembrandt and Vermeer, of Van Leeuwenhoek and Huygens, Spinoza and the great printing culture that fostered Descartes, Bayle, Hobbes, and Locke. The very existence of the Netherlands was perhaps their greatest and

³ Petra Dreiskämper, *Redeloos, Radeloos, Reddeloos: De Geschiedenis Van Het Rampjaar 1672* (Hilversum: Verloren, 1998). The origin of this saying is unclear, but could not have been earlier than the 1730s when the “hopeless” connotation of *radeloos* was first used. <http://gtb.inl.nl/>

⁴ Jan de Vries and Ad van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815* (New York: Cambridge University Press, 1997).

most surprising accomplishment. After defeating the Spanish Empire in a war that lasted eighty years, this loose confederacy born of necessity, bordered by rivals, and seemingly at odds with its own amphibious geography became a dominant European power for a century. In an era defined by “seventeenth-century crisis” in much of Europe, the Dutch proved the great exception.⁵ Indeed, Dutch success was both perplexing and enviable to their European neighbors. “There grows nothing in Holland,” one anonymous English observer declared in frustration, “yet there is the wealth of the world.”⁶ For a country that had flourished amidst the worst of the social, religious, political, and environmental upheavals that plagued Europe during the sixteenth- and seventeenth-centuries, the sudden change in 1672 must have been as traumatic as it was unexpected.

It was also a moment of profound transition. “Who ever lived in more remarkable times,” one pamphleteer remarked in 1672. “When were there ever days with as much change as ours?”⁷ Many of these changes were understandably political and military. William III, head of the House of Orange and grandson of William the Silent who led the Dutch in their revolt against Spain, took advantage of the power vacuum created upon the death of Johan de Witt. By early July, the powerful Maritime Provinces of Zeeland and Holland installed William III as titular

⁵ During the “crisis of the seventeenth-century,” the Netherlands has often been touted as the great exception, although the Dutch also experienced their share of crises. See: Geoffrey Parker, *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century* (New Haven: Yale University Press, 2013). For an examination of this “exceptionality” thesis, see: Ivo Schöffer, “Did Holland’s Golden Age Coincide with a Period of Crisis?”. In *The General Crisis of the Seventeenth Century*, edited by Geoffrey and Lesley M. Smith Parker (London: Routledge and Kegan Paul, 1985): 82-109.

⁶ anon., *The Dutch Drawn to Life* (London: Tho. Johnson, and H. Marsh, 1664), introduction “to the reader.”

⁷ Michel Reinders, “Burghers, Orangists and ‘Good Government’: Popular Political Opposition During the ‘Year of Disaster’ 1672 in Dutch Pamphlets,” *Seventeenth Century* 23, no. 2 (2008): 315-46. Reinders cites: *Dortse En Haagse Woonsdag En Saturdag, of Nader Opening Van De Bibliotheecq Van Mr. Jan De Witth, Zijnde Een Samenspraak Tusschen Een Hagenaar En Dortenaar* (s.n., 1672).

head of the military and *defacto* leader (called a *stadhouder*) of the United Provinces. This change was indicative of a larger shift in political power away from the regents of Holland to the supporters of the House of Orange that would last until William's death. From a military perspective, glimmers of hope appeared as early as July of 1672. Naval victories against the English were quickly followed by the lifting of the siege of Groningen and the recapturing of large parts of the eastern portion of the country. Even the weather seemed to shift favor to the Dutch. In the late summer of 1672, the arrival of sufficient rains brought the *waterlinie* to full effectiveness. By 1674, under the leadership of William III, the United Provinces concluded treaties with England and the German bishoprics, only remaining at war with France. This strategic victory signaled the turning point of this particular conflict, but it also laid the groundwork for decades of costly, destructive wars between the Dutch Republic and (primarily) France, which would last decades longer.

Contemporaries did not limit their characterization of the *rampjaar* to these military or political catastrophes whose worst effects were partly resolved by the end of 1672. The *rampjaar* was a total disaster, felt in every segment of society. It prompted a financial panic that resulted in one of the most dramatic stock market crashes in Dutch history. Shares in the Dutch West India Company (WIC) became "virtually worthless" while shares in the more profitable Dutch East India Trading Company dived from a peak at 572% to 250%.⁸ Although the market would rebound, other economic indicators like public construction, property rents, and even the art

⁸ Jonathan Israel, *Conflicts of Empires: Spain, the Low Countries and the Struggle for World Supremacy, 1585-1713* (London: The Hambledon Press, 1997), 327-328.

market experienced slumps that took decades to recover.⁹ Additionally, hostilities forced the Dutch to recall warships needed to protect overseas trade in order to defend domestic ports. As a result, fishing and many forms of trade ground to a halt.¹⁰ These economic catastrophes only compounded the shock of the military defeats and political upheaval, and some had long-term consequences.

On a cultural level, perhaps the most telling indication of the unsettled mentality of Dutch society was the explosion of pamphlet literature. Over 1,000 pamphlets were published in 1672 in reaction to the *rampjaar*.¹¹ These documents highlighted the deep political divisions that resulted in the revolt and coup, but also moral, religious, and cultural tensions, such as the role of the Reformed Church in state governance and the supposed sinful nature of Dutch society. A common complaint about Dutch culture was its decay from pious modesty, to extravagance and greed. "In truth," one anonymous pamphlet argued, "this our century has, through prosperity and good fortune, degenerated very far from the old simple manners and sobriety."¹² The *rampjaar* provided the providential evidence of God's displeasure with this moral decline.

Pamphlet literature spanned the gamut between sensationalist journalism intended to instill shock and horror in its readers, to social and political critique, to inventories of decay. One of the best-known foreign commentators of the Dutch Golden Age, the English ambassador

⁹ Ibid., 327-328.

¹⁰ Annette Munt, "The Impact of the Rampjaar on Dutch Golden Age Culture," *Dutch Crossing: A Journal of Low Countries Studies* 21, no. 1(1997): 3-51, 4.

¹¹ Michel Reinders, *Gedrukte Chaos: Populisme En Moord in Het Rampjaar 1672* (Amsterdam: Balans, 2010).

¹² Munt, "The Impact of the Rampjaar on Dutch Golden Age Culture," 15. Quoted from: *Huysmans-Praetje, Voorgesteld Tot Onderrechting, Hoe Men Sich in Desen Verwerden En Murmureringe Toestandt Des Tijds Behoorden Te Dragen: En Met Eenem Om Tot Beter Verstant Des Oorsaecks Van De Tegenwoordige Bedroefden Toestant Des Tijds Te Komen: Tusschen Jacob, Klaes En Symon* (1672).

William Temple, offered an analysis that fit closely with this final assessment. “It must be avowed,” he stated, “That as This State in the course and progress of its Greatness for so many years past, Has shined like a Comet; So in the Revolutions of this last Summer, It seem'd to fall like a Meteor, and has equally amazed the World by the one and the other.”¹³ Temple, whose diplomatic position both predated and followed the *rampjaar*, saw 1672 as a turning point in Dutch history -- it was the beginning of Dutch decline.

¹³ William Temple, *Observations Upon the United Provinces of the Netherlands. By Sir William Temple of Shene, in the County of Surrey, Baronet, Ambassador at the Hague, and at Aix La Chapelle, in the Year 1668*, 7th ed. (London: Jacob Tonson, 1705), 256.

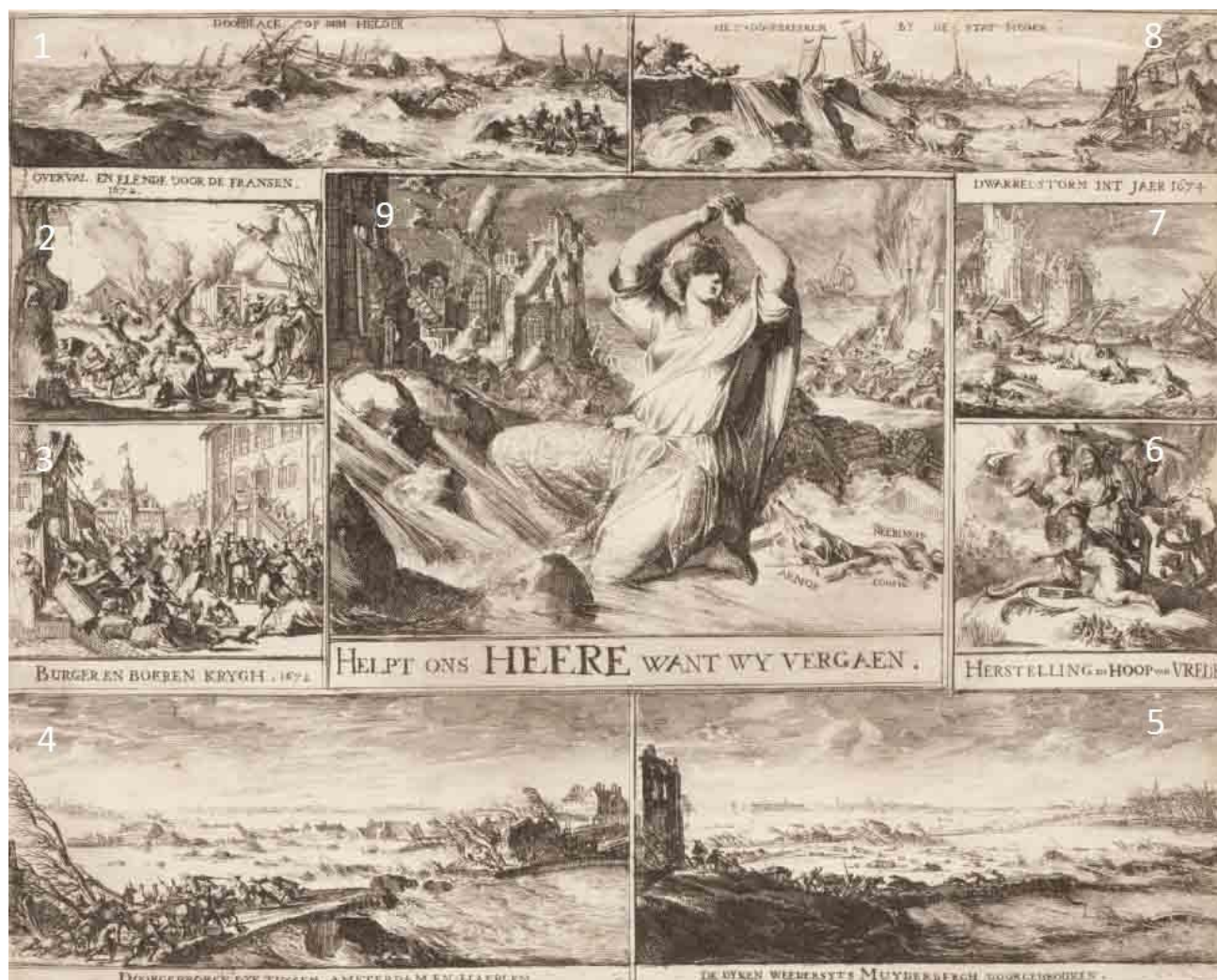


Figure 1.2 Romein de Hooghe, “Miserable Cries of the Sorrowful Netherlands from the Year 1672 to the All Saints Day Flood of 1675” (*Ellenden Klacht Van het Bedroefde Nederlandt. Sedert het Jaer 1672 tot den Aller-heyiligen Vloet van het Jaer 1675*, 1675). This image depicts the disastrous events of the period between 1672 and 1675, here conceptually (and visually) unified into a period of disaster. Courtesy of Zuiderzeemuseum Enkhuizen.

Few documents capture the climate of anxiety and helplessness during the 1670s as potently as artist Romein de Hooghe. His print, *Ellenden Klacht van het Bedroefde Nederlandt* (Miserable Cries of the Sorrowful Netherlands), presents a totalizing vision of the misery of *rampjaar* and its aftermath. (Figure 1.2) The central female figure in panel nine represents the United Provinces. She clasps her hands in desperation as images of wartime atrocities and social unrest surrounds her. Panel two depicts the invasion of the French army and the subsequent “misery” inflicted on the Dutch populace. Below in panel three, De Hooghe depicts the *Borger-en boeren-krijgh* (civilian and farmer struggle) that followed the invasion that pitted “the rich against the rich, the holy against the holy, everyone against each other.”¹⁴ De Hooghe, himself an “Orangist” (a supporter of William III), also depicts the “restoration of hope and peace” and return of civic order under the new *stadhouder* in panel six. From this perspective, De Hooghe’s print appears to be an apologist political statement favoring the return of the House of Orange to a position of political primacy in the Netherlands and the end of the first “*stadhouder*-less” period. The most visually dominant components of the image, however, seem to evoke tragedy. Political and social disasters frame the central figure, thereby explaining her desperation.

Social and political forces constitute only a part of this image’s message, however. The majority of space in this print is dedicated to environmental disasters. Floods and storms rage around the central figure (the maid of Holland) and most of the framing images depict broken dikes or buildings toppled by winds. Panel seven in the upper right, for instance, depicts the

¹⁴ *Ellende Klacht Van Het Bedroefde Nederland Te Sedert Het Jaer 1672 Tot Den Aller-Heyligen Vloet Van Het Jaer 1675* (Amsterdam: Romeyn de Hooge, 1675).

windstorm (*dwarrelstorm*) that destroyed the *Domkerk* of Utrecht in 1674.¹⁵ Panels one, four, five, and eight depict flooding during the Second All-Saints Day Flood (*Tweede Allerheiligenvloed*) that occurred near Amsterdam and in the northeast portion of Holland, a region called West Friesland and the Northern Quarter.¹⁶ Far from conceptually separated, De Hooghe integrates social and nature-induced catastrophes into a common period of disaster that extended from 1672 to 1675. These scenes of nature's violence accentuated the power of social and military catastrophes, but they also underlined the connectedness between the events. Once again, the central panel underscores this point. The broken staff of the god Mercury (representing wealth) lies at the maid's feet, the *Domkerk* crumbles behind her, the inscriptions *armoe* (poverty) and *neeringloosheid* (decay of commerce) swirl in the flood waters around her feet. The large central inscription underscores the figure's distress, giving voice to the gravity of this collective misfortune. "Help us Lord," the inscription pleads, "because we perish."

De Hooghe's *Ellende Klacht* is a fitting point of departure for this broad investigation of nature-induced disaster and Dutch decline in the late seventeenth- and eighteenth-century Netherlands. On the one hand, it effectively visualizes the shock and terror of disastrous events and foregrounds the integrated condition of disaster. The relevance of these themes would continue into the next century, demonstrating broad continuities in disaster interpretation. On the other hand, it highlights a significant change. Despite its many visual cues to the contrary, this

¹⁵ For more on the storm of 1674 in the Netherlands, see Hauer Katrin, "Wahrnehmung, Deutung Und Bewältigung Von Starkwinden. Der Ostalpenraum Und Holland Im Vergleich (1600-1750)" (Universität Salzburg, 2008).

¹⁶ Actually, this *Tweede Allerheiligenvloed* (Second All Saints Day Flood) was even more extensive than this print acknowledges. Flood damage extended from the Wadden Islands and the province of Friesland in the north of the Netherlands, south to Antwerp in present day Belgium. Gottschalk, *Stormvloed En Rivieroverstromingen in Nederland*, 260.

document is optimistic. In fact, it embraces disaster as a trial of faith (*beproeving*) and maintains a confident perspective on the future. “Take heart in her disasters,” the accompanying text to *Ellende Klacht* closes, “She [the Dutch Republic] moves her hands and make right the hardship, saves her commerce and best polders, and she will have power enough left to force her enemies to a fair peace.”¹⁷ The disastrous period between 1672 and 1675 was only temporary hardship according to De Hooghe, not indicative of God’s lasting disfavor. Indeed, cultural historian Simon Schama argues that this type of optimism and focus on trial by adversity was a “formative part” of Dutch Golden Age culture.¹⁸ The final line of *Ellende Klacht* quotes Virgil and underscores the optimistic, Golden Age mentality of weathering ordeals, “*O Passt graviora dabit Deus his quoque finem*” (O friends and fellow sufferers, who have sustained severer ills than these, to these, too, God will grant a happy period).¹⁹ *Ellende Klacht* was a brilliant display of shock and trauma that highlighted the integrated nature of early modern disaster, but its underlying message of resilience proves its provenance in the Golden Age. Little of this Golden Age optimism remained by the mid-eighteenth century.

Between 1672 and 1764, the Golden Age of the Netherlands was in decline. The meaning and explanation for the waning of the Golden Age has been one of the fundamental historical questions of Dutch historiography since the eighteenth century. Modern historians rightly qualify the notion of “Dutch decline,” but contemporaries held no similar compunction and many traced their anxieties straight to the crisis of 1672. Conflicts given voice in the literature of the 1670s

¹⁷ *Ellende Klacht Van Het Bedroefde Nederland Te Sedert Het Jaer 1672 Tot Den Aller-Heyligen Vloet Van Het Jaer 1675* (Amsterdam: Romeyn de Hooge, 1675).

¹⁸ Simon Schama, *The Embarrassment of Riches : An Interpretation of Dutch Culture in the Golden Age* (New York: Knopf, 1987), 25.

¹⁹ *The Works of Virgil Translated into English Prose* (London: Geo B. Whittaker et al., 1826), 197.

echoed throughout the following century as moralists, reformers, and historians debated the reasons for stagnating Dutch culture and economy, and the lessening of Dutch influence and power on the world stage. Waning optimism was only one dimension of this much larger phenomenon. In the words of eminent political historian E.H. Kossmann, “decline was thought to be total, on all levels, in all human endeavor--moral, economic, social, cultural, political.”²⁰ The many environmentally instigated disasters of the eighteenth century underscored and informed this growing unease.

Nature-induced disaster was a fundamental component of Dutch decline. Disasters reflected contemporary anxieties about their flagging economy; they exacerbated buried social tensions, and exposed a perceived moral decay that threatened to undermine the Dutch Republic. They were, therefore, important variables that contributed to the broader contemporary narrative of decline. These perceptions and interpretations of disaster and decline had material foundations as well. Environmental catastrophes had real impacts on Dutch lives and livelihoods, which played an important role in Dutch decline. This dissertation argues that repeated nature-induced disasters had compounding and synergistic influences on Dutch society throughout the era that contributed to decline. Individual disaster events were traumatic and expensive, but the fullest expression of their transformative potential was only realized in the context of a longer period of multiple disasters. From a cultural perspective, disasters were crystallizing events that forced contemporaries to reevaluate tradition, precedent, and the ultimate meaning of disaster. From an

²⁰ E.H. Kossmann, "The Dutch Republic in the Eighteenth Century," in *The Dutch Republic in the Eighteenth Century: Decline, Enlightenment, and Revolution*, ed. Margaret C. Jacob and Wijnand W. Mijnhardt (Ithaca: Cornell University Press, 1992), 28.

economic perspective, disasters worked at the congruence of multiple social, economic, ecological, and climatic stresses to undermine the stability of an already beleaguered agricultural population, which had rippling effects in the cities and throughout most of the country. Disasters, in other words, offer key perspectives on the perceptions, representations, and realities of Dutch decline and its environmental roots.

Decline had multiple faces during the tumultuous Dutch eighteenth century. Despite Kossmann's universal characterization of Dutch decline, contemporary assessments were neither absolute, nor uniform. Disasters revealed that decline was real, but they also show the finer contours and contradictions of its development. Environmental disasters destroyed infrastructure, killed thousands, and incited confusion and panic, but they also catalyzed the development of new water management technologies, medical treatments to combat disease, as well as empirical and scientific examinations of the Dutch environment. These varied responses to the period of disaster, in other words, help explain the broad trajectory of Dutch decline and illuminate developments in Dutch society, science, and their relationship with their environment. Despite the decline historiography's overwhelming focus on trade and geopolitical power, this project demonstrates that science, technology, and the environment were integral parts of the story of decline. This environmental historical approach paints a richly and varied picture of nature-induced disaster at the waning of the Dutch Golden Age.

Sources and Method

Sources are sometimes a challenge in the early modern period, particularly in environmental history. Luckily, disasters often generated significant documentation, especially in

the Dutch Republic which was one of the centers of European print culture.²¹ In the broadest sense, disasters generated two types of documentation, though they were not mutually exclusive: institutional and narrative. In the case of a disaster like the 1675 flood, institutions like provincial committees or water management bodies called water boards (*waterschappen*) produced official reports on the status of dikes and printed numerous resolutions, proclamations, and engineering plans related to repair. Epidemics also generated significant documentation even though the institutional mechanisms for managing disease were not as finely adapted as water management in the Netherlands. Institutional sources are beneficial because they focus on disaster response, provide (usually) reliable assessments of damage and extent, and because they highlight the legal, financial, or political motivations for decision making in the wake of disaster.

Narrative accounts focused more exclusively on large-scale, traumatic events. Sermons, poems, and chronicles depended on dramatic losses and widespread tragedy to generate interest, and in the case of moralist literature, to convey their messages of condemnation or improvement. Even personal documents like diary or journal accounts, which sometimes discussed more local or regional troubles, tended to describe larger-scale events in detail. Delft farmer Paulus Abrahamse van der Spek, for instance, documented the “trials” of his life from 1738 to 1786. Although he did not neglect the localized “storm winds” or “heavy rains” that affected his livelihood, he dedicated his most thorough documentation to widespread disasters like mouse infestations and cattle plagues that affected much of the Netherlands in the early 1740s.

²¹ It is also unsurprising because large-scale disasters tended to produce large amounts of documentation in any context. Rudolf Brázdil et al., “Historical Climatology in Europe – the State of the Art,” *Climatic Change* 70, no. 3 (2005), 398.

Narrative accounts could be descriptive, didactic, and oftentimes both. For instance, amateur medical or scientific treatises tended to place equal weight on empiricism and argumentation. Authors wanted to display their learned credentials, but also (in the case of the shipworm descriptions) to sell a solution. Narrative accounts are useful because they offer a broader social perspective than institutional record keeping. What they might lack in specificity regarding the social or environmental effects of a disaster, they make up for in their ability to speak to larger themes like the connections between disasters and decline.

Visual depictions of disasters were almost exclusively narrative in approach. They are by far the rarest type of source. Very few paintings of disasters exist from the early modern Netherlands, and the extant few almost exclusively depict large-scale disasters.²² Disaster prints and etchings are more common because they sometimes accompanied mass-produced pamphlets that documented these large disasters. De Hooghe's print represents a still rarer genre, depicting multiple disasters in one composite image. Surprisingly, very little art historical scholarship focuses on the production or meaning of disaster art in the Dutch Republic. Art historian Arthur Wheelock argues that the lack of disaster imagery in the Golden Age was a byproduct of Golden Age optimism. "The overall impression one receives from prints, drawings, and paintings," Wheelock argues, "is that this land was a veritable Arcadia and this its people, blessed by God's munificence, lived a life of peace and prosperity."²³ During the Golden Age, artists emphasized

²² One exception was the St. Antoniesdijk breach in March 1651, which inspired multiple paintings, sketches, and prints. The flood of 1651 was regionally serious, but according to geographer MKE Gottschalk "cannot be counted amount the major, catastrophic [storm] surges." Gottschalk, *Stormvloed en Rivieroverstromingen in Nederland*, 176. It was likely the high number of artists in Amsterdam that explained its disproportionate representation.

²³ Arthur K. Wheelock Jr., "Accidents and Disasters," in *Time and Transformation in Seventeenth-Century Dutch Art*, ed. Susan Donahue Kuretsky (Poughkeepsie, NY: Vassar College, 2005), 73.

these positive perspectives. While still not abundant, depictions of disaster events became increasingly common over the course of the eighteenth century, itself perhaps an indication of the growing cultural pessimism, or at the very least the increasing social and cultural relevance of disaster. Visual source material in the form of maps, diagrams, paintings, and prints are an integral part of this project. This dissertation makes innovative use of these sources to reveal the shock and trauma of disaster, the ambitions of technocrats and moralists, and the fears of a population amidst decline.

“Disaster” in the Early Modern Netherlands

“Dutch decline” and “disaster” are both contentious concepts in modern scholarship. What were “disasters” in the early modern Netherlands? Are they best understood as discrete events or longer-term processes? What role did disaster play in the discourse and actuality of Dutch decline? The remainder of this chapter frames these questions, which are the foundation of this study on nature-induced disaster and the decline of the Dutch Golden Age. The *rampjaar* and De Hooghe’s print in particular, speak to these subjects. In doing so, they also invite the viewer to engage several other fundamental issues in historical disaster scholarship, environmental history, and Dutch historiography of the eighteenth century.

What was a “disaster” in the early modern Netherlands? This is a critical question because the Dutch construction of disaster informed their interpretation and response. To the early modern Dutch, disasters revealed God’s judgments. They were supra-natural occurrences that displayed divine intervention into the ordinary workings of nature, itself a divinely ordered system termed “general providence.” Disasters were instances when God suspended general providence to indicate his displeasure, oftentimes as a result of human sin. Any perturbations in the ordinary workings of nature might signal God’s wrath. Uncommon or unexpected

“meteorological” events like comets, eclipses, and apparitions in the sky, therefore accompanied (and sometimes presaged) earthquakes, epidemics, frosts, floods, and warfare.²⁴ The providential messaging of *Ellende Klacht* conformed to this early modern interpretation of disaster.

From this perspective, it is immediately clear that the Dutch interpreted disasters broadly, at least in comparison to the modern segregation of “naturally” or “socially” instigated events. Scholars today rarely use the term “disaster” in manner conducive to early modern understanding. The modern classification of economic-, techno-, natural, or “unnatural” disasters assigns blame and delimits possible causation to a few broad categories that are not easily integrated. Since the 1960s, disaster scholars have problematized this rigid separation. “Disasters,” in the words of anthropologist Anthony Oliver-Smith, “occur at the intersection of nature and culture and illustrate, often dramatically, the mutuality of each in the constitution of the other.”²⁵ Until recently however, these investigations had largely focused on the modern period, as scholars theorized hazards and especially risk as constitutive elements of modernity.²⁶ Over the past twenty years, environmental historians have taken a leading role by extending investigations of risk and vulnerability into the past and evaluating the transformative role of

²⁴ Rosemarie Zeller, “Reading Images of Natural Disaster in Printed Media of Early Modern Europe,” in *Disaster as Image: Iconographies and Media Strategies across Europe and Asia*, ed. Monica Juneja and Gerrit Jasper Schenk (Regensburg: Schnell & Steiner, 2014), 55.

²⁵ Anthony Oliver-Smith, “Theorizing Disasters: Nature, Power, and Culture,” in *Catastrophe & Culture: The Anthropology of Disaster*, ed. Susanna M. Hoffman and Anthony Oliver-Smith (Oxford: James Currey, 2002), 24. Oliver-Smith was part of a wave of social scientific interest in disasters during the second half of the twentieth century. See: Ian Burton, *The Environment as Hazard*, ed. Robert W. Kates and Gilbert F. White (New York: Oxford University Press, 1978); Kenneth Hewitt, *Regions of Risk: A Geographical Introduction to Disasters* (Harlow, Essex: Addison Wesley Longman, 1997).

²⁶ Ulrich Beck, *Risk Society: Towards a New Modernity* (London: SAGE Publications, 1992).

environmental disasters in history.²⁷ Historian Greg Bankoff's assertions that "there are no such things as 'natural disasters'" and "disasters are quintessentially historical" acknowledges the early social scientific work that broke down the barriers between natural and social disasters while also claiming a role for history in disaster studies.²⁸ Environmental historian Christian Pfister argues that an alternative might be "nature-induced disasters," which acknowledges the social construction of disaster while also recognizing the value of maintaining a focus on environmental conditions.²⁹ This study builds on these recent historiographical insights and favors an integrated, environmental perspective on historical nature-induced disasters.

De Hooghe's *Ellende Klacht* immediately shows the value of this approach. His juxtaposition of social unrest, environmental hazard, and economic decline underscores the broadly synthetic character of the early modern Dutch characterization of disaster. Economic,

²⁷ Thus far, German scholars have dominated this discussion as evidenced in two edited volumes. Christof Mauch and Christian Pfister, eds., *Natural Disasters, Cultural Responses : Case Studies toward a Global Environmental History* (Lanham, MD: Lexington Books, 2009); Andrea Janku, Gerrit Jasper Schenk, and Franz Mauelshagen, *Historical Disasters in Context: Science, Religion, and Politics* (New York: Routledge, 2012). For an overview of (largely) German contributions to the environmental history of disaster, see Gerrit Jasper Schenk, "Common Grounds in Early Modern Disaster Experiences? Some Remarks on New Trends in Historical Disaster Research as Part of Environmental History and Climate History," in *An Environmental History of the Early Modern Period: Experiments and Perspectives*, ed. M. Knoll and R. Reith (Berlin: Lit Verlag, 2014). Outside Germany, environmental and disaster scholars have highlighted in particular the geographically-inscribed and socially-directed conditions of risk, differential vulnerabilities to environmental hazards based on race, class, or gender, and the synthetic associations between adaptation and disaster. Theodore Steinberg, *Acts of God : The Unnatural History of Natural Disaster in America* (New York: Oxford University Press, 2006). The degree to which these frameworks for understanding disaster have been institutionalized is exhibited in recent Intergovernmental Panel on Climate Change Assessment reports. "Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change," in *IPCC AR5*, ed. C.B. Field, et al. (New York: Cambridge University Press, 2014).

²⁸ Greg Bankoff, "Comparing Vulnerabilities: Toward Charting an Historical Trajectory of Disasters," *Historical Social Research / Historische Sozialforschung* 32, no. 3 (121) (2007), 103, 110.

²⁹ Christian Pfister, "Learning from Nature Induced Disasters," in *Natural Disasters, Cultural Responses: Case Studies toward a Global Environmental History*, ed. Christof Mauch and Christian Pfister (New York: Lexington Books, 2009).

cultural, and environmental changes were deeply intertwined (this is perhaps the greatest historical lesson of this image). Contemporaries understood nearly all disasters to be fundamentally socially constructed, whether due to direct human mismanagement or indirectly because of human sin. While *ramp* is perhaps the closest modern approximation to the English word “disaster,” the early modern Dutch most often employed the designation *oordeel* (judgment). Too often, disaster scholarship sidelines the role of providence, granting it a role in disaster perception, but not in adaptive decision-making or coping strategies. From a modernist perspective, scholars treat “acts of God” synonymously with accident or fate.³⁰ This distinction breaks down in the early modern period, however. Disasters undoubtedly carried useful social and political messages in the early modern Netherlands (the Orangist undertones of De Hooghe’s print are evidence of this), but providence played a much more active and public role in disaster response. Providentialism was a coping strategy, explaining loss and offering repair. It promoted adaptation, particularly in the realm of water control. The early modern Dutch, for instance, drew profound connections between their mastery of water and their providential role as a “chosen people,” though by the eighteenth century both their technical mastery of nature and chosen status were more in doubt.³¹ Importantly, it connected disasters events together. Providence was therefore a crucial component of the period of disaster and a linchpin connecting disasters to the larger process of Dutch decline.

³⁰ This has had the benefit of opening up disaster scholarship to related historical disciplines. Ted Steinberg makes connections to environmental justice by arguing that interpreting disasters in this manner perpetuates social disparities by transferring blame from people to “God” or nature. Steinberg, *Acts of God : The Unnatural History of Natural Disaster in America*.

³¹ Schama, *The Embarrassment of Riches : An Interpretation of Dutch Culture in the Golden Age*.

The Dutch defined disasters broadly, but they typically shared two common elements. First, they were typically large in scale. They affected significant areas of the Netherlands and sometimes even extended into neighboring countries. Second, they were costly. Major disasters could kill thousands of people and animals and destroy enough property to impoverish communities for decades. Each of these factors contributed to disasters' ability to shape or reflect decline. Dutch accounts often emphasized the geographic scale of disasters to highlight the scope of human loss. With the exception of city fires or extraordinary local tragedies, early modern Dutch disaster imagery and literature focused on large events.³² Coastal storms, for instance, affected the extensive coastline of the Netherlands. The 1675 floods depicted in *Ellende Klacht* focused on a large region of Holland, but related flooding extended from East Friesland in Germany south to Antwerp in Belgium.³³ Prints of disasters oftentimes emphasized geographic scale. Simon Fokke's composite map/image of the Rhine river flood of 1753 and 1754 captures both the localized reaction as well as the full extent of flood destruction. (Figure 1.3) The upper portion of Fokke's drawing highlights the desperate attempts of inhabitants to save themselves and their belongings. A boat in the background rescues victims clinging to the roof of a house; in the foreground, farmers herd their cattle and lift a child to the safety of dry land. The bottom portion of the drawing, however, charts the geographic extent of the flood. Two cherubs grasp a map of the Rhine River from the Dutch city of Kampen on the Zuiderzee to the German city of

³² The most famous exception was the Delft gunpowder explosion, which was heavily documented in textual and visual culture because of its high visibility in a large city populated by artists. Wheelock Jr., "Accidents and Disasters," 75-76.

³³ Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 24.

Emmerik.³⁴ This drawing demonstrated a common textual and visual strategy when describing disaster, juxtaposing the local with the general to highlight the human and economic toll of disasters.

³⁴ The Rhine flooded along much of its course in 1754 because of heavy rains in December 1753 and January 1754. For a contemporary account, see: "Foreign Affairs," *London Magazine: Or, Gentleman's Monthly Intelligencer* 1754, 46.



Figure 1.3 *Breach of the Rhine and IJssel Dikes (Doorbraak van de Rijn- en IJsseldijken, 1754)*, Simon Fokke, 1754. Fokke's image of the 1754 river floods highlight the common motif in disaster prints of incorporating a map of the affected regions into a composite image that also includes depictions of the events and allegorical imagery. This print has all three and the inclusion of the map demonstrates the centrality of scale in the Dutch conception of disaster.

Narrative accounts also emphasized the severity and exceptionality of events by showing their scope. “In Overijssel, Gelderland, now in Zutphen, Zwolle and Kampen, and Mastbroek,” one account of the river floods of 1753/154 began, “the terrible streams of water broke through the IJsseldijk and spread out everywhere over the land.” The scope of this disaster once again underscored the wrath and power of God. It also invited consideration of the larger meaning of disasters. The floods of 1753/54 came on the heels of multiple disasters in previous decades including “cattle afflicted with disease,” “worms gnawing through (dike) piles,” and the “wretched times of war.”³⁵ The author integrated this extensive flood into a period of disaster that spoke to larger concerns about decline. It closed with a prayer “that our land might again grow in abundance of fruit and spice, where now the water overflows, devoid of the feet of men and beasts.”³⁶ Large-scale disasters, in sum, were costly, morally meaningful events that reflected larger anxieties about reoccurring disasters and decline.

Disasters were also deadly and expensive. Contemporaries paid close attention to disaster impacts and measured the cost of catastrophe in terms of lives or property lost. Both institutional and narrative sources privileged this perspective, though for different reasons. Institutional accounting drew on local resources to tally and collect information. By the end of the sixteenth century, parish priests and community ministers throughout the Netherlands kept detailed birth, death, and baptismal records, as well as housing censuses.³⁷ After disasters, they oftentimes counted the number of dead and the amount of property lost after disasters and sent the figures to

³⁵ *Klaag-Liet, Uitgeboesemt over De Inbreuke En Overstroming Der Vreeslyke Wateren Ontrent Zwolle, Kampen En Zutphen [...] Voorgevallen In't Laatste [...] Des Voorgaanden Jaars 1753. En in Het Begin [...] Deses Jaars 1754* (Maria van den Berge, 1754), 2.

³⁶ *Ibid.*, 7.

³⁷ *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 452-453.

provincial institutions. Provincial committees and cities needed this information because many of the most ruinous disasters disrupted provincial finances by destroying infrastructure or undermining their ability to tax people and property.³⁸ Following the regionally destructive St. Martins Flood of 1686, for instance, provincial estimates indicated that almost 1600 people and over 10,600 livestock died in the province of Groningen.³⁹ Institutional accounting interpreted the cost of disaster in terms of their effects on taxes and sometimes the labor necessary for repair. Repeated disasters compounded these difficulties and were so serious by the mid-eighteenth century, that requests for tax remission became commonplace in some areas of the Netherlands.

Narrative accounts also privileged the accounting of losses, but frequently used these figures as emotional leverage to support their arguments or dramatize their descriptions. Providential accounts reproduced institutional records to emphasize the severity and scope of the disaster, both important indicators of God's wrath.⁴⁰ Contemporary historians also drew on institutional figures in their descriptions of towns and provinces, though they sometimes interspersed these with exaggerated estimates of semi-mythical disasters in the deep past.⁴¹

³⁸ Ministers and sometimes sheriffs kept these tallies. For a list of the drowned during the St. Martins Flood in Groningen, for instance, see: *Resolutie (14 Jan) 1687*. Staten van Stad en Lande. 1. 817. Groninger Archieven.

³⁹ *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 137.

⁴⁰ Gerhardus Outhof, *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden, in Meest Alle Plaatsen Van Europa, Van Noachs Tydt Af, Tot Op Den Tegenwoordigen Tydt Toe: Met Een Nieuw Kaertje Van't Verdrongen Landt in Den Dollaart, Afbeeldinge Van Kosmas En Damianus En Van Den Steenenman in Vrieslandt: Met Eene Breede Beschryvinge Van Den Zwaaren Kersvloedt Van 1717, En Bygevoegde Tafels Der Watervloeden* (Embden: H. van Senden, 1720), 629-632. Simon Gabbema likewise included this list in his compendium of floods. Simon Abbes Gabbema, *Nederlandse Watervloeden, of Naukeurige Beschrijvinge Van Alle Watervloeden Voorgevallen in Holland ... En De Naaburige Landen* (Gouda: Lucas Cloppenburg, 1703), 364-368.

⁴¹ Historical geographer Elisabeth Gottschalk famously fact from fiction in her, now canonical, three part work on "Coastal and River Floods of the Netherlands." Gottschalk, *Stormvloeden En Rivieroverstromingen in Nederland*.

Whether used for dramatic effect or institutional accounting (or both), death and loss defined Dutch disaster.

Disasters: Event and Process

Disasters were significant events, both costly and expansive. They were also processes, often born out of longer-term natural and cultural relationships. Historians have only recently begun to explore the potential of evaluating disaster as a developing condition, rather than merely discrete events. Much of the early historiography of disaster identified singular, unpredictable, dramatic events as pivotal moments in history.⁴² The early modern period was particularly amenable to this tendency as it was the critical period of transition into modernity. While more nuanced and critical of this approach, there remains a rich tradition of event-based research in this era of which the 1703 London windstorm, the 1720 Marseilles plague episode, and the Lisbon earthquake of 1755 are famous examples.⁴³ Disasters often fit this mold and catastrophic events are a necessary point of departure for disaster history, but historians should integrate events into a gradualist evaluation of human response.⁴⁴

⁴² Kenneth Hewitt identified this trend as early as 1983. Kenneth Hewitt, "The Idea of Calamity in a Technocratic Age," in *Interpretations of Calamity* (London: Unwin-Hyman, 1983). Hewitt argues that this event-centered, near-determinist model of disaster analysis overemphasizes the uniqueness of disaster events and hides their roots in "normal everyday life." This trend is also supported by more recent sociological research into "focusing events" or episodes of dramatic, catastrophic change that catalyze policy action, media attention, and community mobilization. Thomas A. Birkland, *After Disaster : Agenda Setting, Public Policy, and Focusing Events* (Washington, D.C.: Georgetown University Press, 1997).

⁴³ Event-centered research abounds on these disasters, but an excellent example covering each is: Alessa Johns, ed. *Dreadful Visitations: Confronting Natural Catastrophe in the Age of Enlightenment* (New York: Routledge, 1999).

⁴⁴ Wolfgang Behringer argues that maintaining an event-centered perspective should be the "first commandment" of disaster research. Wolfgang Behringer, "Der Krise Von 1570. Ein Beitrag Zur Krisengeschichte Der Neuzeit," in *Um Himmels Willen: Religion in Katastrophenzeiten*, ed. Manfred Jakubowski-Tiessen and Harmut Lehmann (Göttingen: Vandenhoeck & Ruprecht, 2003), 153.

In the context of this study, general concepts like cultural memory or historical trends like dike professionalization only acquire definition when considered over the long term.⁴⁵ Event-based scholarship, on the other hand, illuminates the social and natural conditions (and contradictions) of their development. In the case of Dutch disasters, disaster-induced learning was a lengthy process that fostered new ideas about disaster causation, management strategies, hydrotechnologies, and medical practices. In the short-term, however, disaster events could equally feature un-learning and the retrenchment of pre-existing modes of understanding and design. These moments are largely invisible in deep perspective. On the same token, cultures of coping depended on centuries of traditions, design experience, and refinement of memory, but their historical relevance only crystalizes in the presence of catastrophic events. Disasters are best interpreted in both short and long-term context.

Contemporaries also interpreted disasters as processes. Dutch natural historian Zacharias L'Epie began his treatise on shipworms, for instance, by describing long-term changes in the environment because he “realized that a fair idea of the trouble with the worms could not be made without first establishing a necessary awareness of the condition of the landscape itself.”⁴⁶ L'Epie was well-aware that the sudden appearance of shipworms was predicated in the anthropogenic transformation of Holland. More frequently, contemporaries recognized that

⁴⁵ I use “cultural memory” here in the tradition of Jan Assman; “cultural memory” being a form of collective identity production as well as a process of preserving and/or forgetting events. Jan Assmann, “Communicative and Cultural Memory,” in *Cultural Memory Studies: An International and Interdisciplinary Handbook*, ed. Astrid Erll and Ansgar Nünning (Berlin: Walter de Gruyter, 2008). This approach was employed to evaluate flood memory in Michael Kempe, “‘Mind the Next Flood!’ Memories of Natural Disasters in Northern Germany from the Sixteenth Century to the Present,” *The Medieval History Journal* 10, no. 1&2 (2007).

⁴⁶ Zacharias L'Epie, *Onderzoek over De Oude En Tegenwoordige Natuurlyke Gesteldheyd Van Holland Dog Voornamentlyk West-Vriesland Ten Opzigte Van Deszelfs Rivieren En Landen, Aanwas, Ophooging, Zakking, Laagte En Dykagie...* (Amsterdam: Erven van J. Ratelband, 1734), 2.

earlier disasters played an important role in ongoing troubles. Disaster literature often compared disasters or compiled chronologies of disaster events, explicitly connecting past disasters to the present. This strategy had multiple goals. It accentuated the emotional shock of events, emphasized their scale and severity, and reinforced arguments about disaster causation. In a description of the events surrounding the Second All Saints Day Flood of 1675, for instance, one commentator began his account, not with the event, but with its context. “God sent punishment upon punishment,” it stated, “he added plague upon plagues.”⁴⁷ Contemporaries sought meaning and significance in disaster events, as well as periods of disaster—a perspective lost in the absence of a longer-term perspective.

This project treats disasters as both events and processes. Four case studies of discrete disaster events during the eighteenth century offer the historical specificity necessary to unearth the role of contingency, individual action, and the environmental particularities of natural hazards. Only with this high resolution picture of disaster is it possible to disentangle the rationale for adaptation or retrenchment in the wake of disasters. These case studies also contribute to a larger investigation of how and why the Dutch integrated these disasters into a longer period of disasters. This vision of disaster-as-process foregrounds the importance of memory, long-term processes of professionalization, and the subtly changing interrelationship between spiritual and secular realms of response. Importantly, this integrated approach is necessary to foreground the role of disaster events (and series of events) in the longer-term contemporary narrative of Dutch decline.

⁴⁷ Dirck Gerritsz. Noordlandt, *Kort Verhael Van De Ongemacken Die Het Noorder-Landt over-Gekomen Zijn Door Een Water-Vloedt, Tusschen Den 4 En 5 Nov. 1675* (Hoorn: Stoffel Jasz. Kortingh, 1677), A5.

From Disaster to Decline

Decline is a contentious subject in Dutch historiography and it has a venerable history extending back to the eighteenth century. Already in the 1780s, Dutch historians bemoaned the declining state of the Netherlands, particularly after the pitiful defeat of the United Provinces in the Fourth Anglo-Dutch War (1780-1784). Historians largely reaffirmed this negative picture of the Dutch eighteenth century well into the twentieth century. They disparagingly referred to this era as the *pruikentijd* (Periwig Period): an era of mixed economic fortunes, declining political stature, and cultural stagnation.

Modern historians offer more critical assessments. The Dutch Republic did not plummet like a meteor, but rather waned over the better part of century as other European powers gradually eclipsed its influence. Even considering this refined assessment, decline remains a popular and hotly contested subject in scholarship. Economic historians dominate the debate and offer differing perspectives on the phenomenon. They point to demographic changes, the collapse of historically important industries like textiles and fishing, or the cumulative weight of decades of wartime taxation imposed by a rigidly unchanging tax farming system.⁴⁸ Some challenge the periodization of decline (arguing it began as early as 1650, others as late as the 1730s); others qualify its spatial extent (it largely affected the western Maritime Provinces while the much more sparsely populated east experienced growth in some cases); still others stress its

⁴⁸ Marjolein 't Hart, "Town and Country in the Netherlands, 1550-1750," in *Town and Country in Europe, 1300-1800*, ed. S. R. Epstein (Cambridge: Cambridge University Press, 2001), 100; Johan de Vries, *De Economische Achteruitgang Der Republiek in de Achttiende Eeuw* (Leiden: Stenfert Kroese, 1968); J. Aalbers, "Holland's Financial Problems (1713-1733) and the Wars against Louis XIV," *Britain and the Netherlands* 6(1978): 79-93.

relative rather than absolute character.⁴⁹ Even considering this range of options, few reject its actuality. Political historians point to the lessening international influence of the Dutch Republic, particularly after the War of Spanish Succession in 1713.⁵⁰ Cultural historians agree. “It is beyond serious dispute that the great cultural flowering of the seventeenth century did come to an end,” cultural historian J.L. Price argues, “and that Dutch culture in the eighteenth century was very different in important respects—and certainly less distinctive and innovative.”⁵¹ In general, scholars debate the periodization and reason for decline, but most agree that a gradual decline took place during the eighteenth century.

Despite the historical consensus about its gradual development, isolated disaster events and crisis-moments nonetheless occupy a privileged place in decline scholarship. Political disasters punctuated much of the period between 1672 and the late eighteenth century. The Dutch Republic, for instance, was the only country in Europe to experience revolution in the mid-eighteenth century. It would finish the century with two, the first in 1747 (whose causes echoed the *rampjaar*) and the second in 1780s.⁵² Likewise, economic historians point to a series of financial disasters, particularly the international stock market crash of 1720 and the banking

⁴⁹ J.C. Riley, "The Dutch Economy after 1650: Decline or Growth?," *Journal of European Economic History* 13(1984): 521-69.

⁵⁰ A.T. van Deursen, "The Dutch Republic, 1588-1780," in *History of the Low Countries*, ed. J.C.H. Blom and E. Lamberts (New York: Berghahn Books, 2006), 201-210.

⁵¹ J.L. Price, *Dutch Culture in the Golden Age* (London: Reaktion Books, 2012), 244.

⁵² For more on these revolutions, see: Jonathan Israel, *The Dutch Republic : Its Rise, Greatness, and Fall, 1477-1806* (New York: Oxford University Press, 1995), 1067-1078; Margaret C. Jacob and Wijnand W. Mijnhardt, *The Dutch Republic in the Eighteenth Century: Decline, Enlightenment, and Revolution* (Ithaca: Cornell University Press, 1992). They also experienced repeated instances of unrest and even overt rebellion in 1748 that featured mob violence against tax farmers (*pachtersoproer*). Rudolf Dekker, *Holland in Beroering: Oproeren in De 17de En 18de Eeuw* (Baarn: Ambo, 1982).

crisis of 1763.⁵³ Even cultural historians point to the *rampjaar* as a crisis moment in Dutch art production.⁵⁴ Dutch historiography of seventeenth- and eighteenth-century crises largely focuses on these dramatic political or economic events, framing them in the context of the greater decline of the Dutch Republic. Historians treat extreme events like stock market crashes or political revolts as symptomatic of larger changes that contributed to the declining fortune of the Dutch Republic.

If the many political and financial disasters of this era revealed or informed contemporary understanding of decline, then nature-induced disasters have equal, if not more explanatory power. The accompanying text to De Hooghe's print clearly contrasts the historic (blessed) condition of Netherlands with ongoing troubles. Speaking from the perspective of the personified Netherlands, De Hooghe declared, "I was an arbiter of crowns, the darling of prosperity, a mirror of the world...now heaven, earth, and sea rise up against me."⁵⁵ In 1672 at the beginning of the period of decline, De Hooghe viewed this inversion as temporary. Over the course of the late seventeenth- and eighteenth centuries, however, nature-induced disasters destroyed this optimism. Cattle plagues turned Arcadian pastures to killing fields and floods turned land to watery waste. Following the Christmas Flood of 1717, for instance, one anonymous author bemoaned the conversion of his fields into lakes. "The fruitful land," he declared, "was turned to

⁵³ W.N. Goetzmann, *The Great Mirror of Folly: Finance, Culture, and the Crash of 1720* (Yale University Press, 2013); C.P. Kindleberger and R.Z. Aliber, *Manias, Panics and Crashes: A History of Financial Crises, Sixth Edition* (Palgrave Macmillan, 2011).

⁵⁴ Munt, "The Impact of the Rampjaar on Dutch Golden Age Culture."

⁵⁵ *Ellende Klacht Van Het Bedroefde Nederland Te Sedert Het Jaer 1672 Tot Den Aller-Heyligen Vloet Van Het Jaer 1675* (Amsterdam: Romeyn de Hooge, 1675).

salted ground.”⁵⁶ De Hooghe’s print exemplified the integration of nature-induced disasters into larger discussions of prosperity, providence, and power during this era, but by the mid-eighteenth century, few contemporaries argued so confidently for the Dutch return to prosperity.

The role of nature-induced disasters in Dutch decline extended beyond this discursive function as well. Environmental catastrophes were expensive and their effects often long lasting, especially when coupled with wars, taxation, and other sorts of nature-induced disasters. Institutional sources explicitly described these conditions. A report from a dike reeve in north Holland during the 1730s, for instance, noted that fully one-fifth of his entire jurisdiction has been abandoned (*spade gestookten*).⁵⁷ “It is not so very hard to imagine,” he explained, considering the amount of taxes born “during all of the disasters, wars, and catastrophes” (*Rampen, Oorlogen, en Desastres*) which included cattle plague, floods, and a shipworm epidemic.⁵⁸

Narrative sources also highlighted the economic consequences of disasters as a tool to heighten their emotional impact. The town of Zegveld in the province of Utrecht was a case in point. Much of its agricultural lands were inundated as part of the original *waterlinie* strategy that protected Holland in 1672. Zegveld was still recovering from the *rampjaar* in 1713 when, in

⁵⁶ H.F., *Treurdigt Ter Droeviger Gedagtenisse Van De Vreeselyken En Verderffelyken Watervloed Den 25sten Van Wintermaan Mdccxvii En Enige Volgende Dagen, Gebragt Oover Holland, Friesland, Omlanden En Derselver Naburen* (Amsterdam: Johannes Douci, 1718), A4.

⁵⁷ “Spastaking” was a ritualistic sign of land abandonment whereby an insolvent landholder would place or leave his spade in a dike, which would then transfer to the municipal authorities. Although a relic of oral tradition, it had legal significance.

⁵⁸ *Beschryvinge, Van De Schade En Raseringe Aan De Zee-Dyken Van Noort-Hollanden West-Vriesland, Door De Worm in De Palen, En De Daar Op Gevolgde Storm, En Vervolgens: Waar by Komt Een Beschryving Van Een Nieuwe Water-Machine* (Hoorn: Jacob Duyn, 1732), 15.

a cruel repetition of the events, a powerful windstorm similar to the one that destroyed part of the *Domkerk* in Utrecht in 1674 damaged the church tower of the town.⁵⁹ The Dutch integrated these environmental and social disasters into their larger anxieties about decline. “Gods hand has many times driven the horse of war, through water, fire and bullets, through disease and opposition,” wrote Frisian minister Wijnandus van Assen in 1732, “the fruitful Netherlands is threatened with decline.”⁶⁰ The importance of disasters demands that environmental dimensions must be added to E.H. Kossman’s assessment of decline.

Despite the close connections that contemporaries drew between disasters and decline, catastrophe paradoxically revealed the inadequacy of the decline thesis. While elements of Dutch Golden Age culture, key sectors of industry, and public confidence may have decayed, the Dutch eighteenth century was remarkably dynamic. It featured new developments in technology and emerging success stories in science and medicine. Disasters inspired innovation and forced society to reevaluate traditional understandings of the environmental foundations of Dutch prosperity. Dutch physician Herman Boerhaave dominated early eighteenth-century medicine in Europe and his influence extended beyond human health into the realm of animal medicine.⁶¹ By the second outbreak of cattle plague in the 1740s, Boerhaavian physicians, surgeons and other medical practitioners extended his system of medicine to cattle, contributing new remedies and an entirely new class of animal patients.

⁵⁹ Ronald Rommes, "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw," *Jaarboek Oud Utrecht* (2001): 88-136.

⁶⁰ Wijnandus van Assen, *Vertooninge Van Onheilen Door De Zonde Veroorzaakt: Toegepast Op De Tegenwoordige, Van Gods Handt Regtveerdig Toegezondene Worm-Plaag* (Pieter Koumans, 1732), 5.

⁶¹ Andrew Cunningham, "Medicine to Calm the Mind: Boerhaave's Medical System, and Why It Was Adopted in Edinburgh," in *The Medical Enlightenment of the Eighteenth Century*, ed. Andrew Cunningham and Roger French (Cambridge: Cambridge University Press, 1990).

Technological development may have been the clearest exception to decline, at least from the perspective of foreigners. Writing in 1749, Englishman Thomas Nugent declared that “there is no nation where the people apply themselves with more diligence to all manner of mechanic arts, than the inhabitants of the United Provinces.”⁶² Dutch talent at reclamation, dike building, shipbuilding, and mills had been well known during the Golden Age, but general recognition of Dutch “technological leadership” in Europe only climaxed in the eighteenth century.⁶³ Disasters such as coastal and river floods, as well the shipworm epidemic of the 1730s, repeatedly tested and invigorated Dutch expertise. The last fifty years of scholarship has already established that Dutch decline was neither uniform nor absolute, but disasters offer a unique opportunity to enrich this historical perspective.

This project highlights the uniqueness and complexity of a period that, in Dutch historiography, is relatively underappreciated. The period between 1672 and 1764 is a curious non-sequitur sandwiched between the flourishing Golden Age and the political and intellectual revolutions of the late-eighteenth century.⁶⁴ This study ends with the second wave of cattle plague epidemics because it was the last major disaster to precede this revolutionary era, but disasters continued to afflict the Netherlands between the 1770s and Napoleon’s conquest of the

⁶² Thomas Nugent, *The Grand Tour* (London: S. Birt, D. Browne, A. Millar and G. Hawkins, 1749), 32.

⁶³ Karel Davids explores the idea of Dutch technological leadership, as well as the difference between perceived leadership and actuality in Karel Davids, *The Rise and Decline of Dutch Technological Leadership: Technology, Economy and Culture in the Netherlands, 1350-1800*, 2 vols (Leiden: Brill, 2008). Importantly, not all realms of Dutch technology featured innovation. One notable exception was agricultural technology.

⁶⁴ The revolutions included the Patriot revolt that forced *stadhouder* William V into exile in 1785 and the Napoleonic revolution that toppled the Dutch Republic in 1795 as well as revolutions in disasters management including: the founding of centralized water management (*Rijkswaterstaat*) in 1798, the founding of the “Economic Branch” of the Holland Scientific Society in 1777 whose goal was national economic renewal, and the establishment of the “veefonds” in 1799 as a national system to compensate farmers for cattle plague losses.

Dutch Republic in 1795. Still, scholars have given these later decades great attention because of their significance to enlightenment studies, state formation, and modernization of environmental management.⁶⁵ While it is beyond the scope of this project to evaluate the period of disaster in this later context, the period of nature-induced catastrophes between 1672 and 1764 undoubtedly played a formative role in these realms as well. Indeed, much of the Dutch response (particularly following the shipworm epidemic of the 1730s) hints at the broader relevance of state intervention and an enlightened organization of the understanding of nature. The curious mixture of disaster and dynamism between the 1770s and the 1790s was in many ways a coda for what came before.

Although less studied, this first part of the eighteenth century was the crucible of Dutch decline. During the first two-thirds of the eighteenth century, rapid and impressive innovations in the context of water management, animal medicine, and natural history belie uniformly declensionist interpretations. On the other hand, this era also displayed surprising inactivity despite massive environmental pressures. The early eighteenth century resists easy categorization. Dutch institutional reactions to invasive epizootics, for example, demonstrate the continuity of governmental regulation across half a century, whereas a short-lived and demonstrably less-threatening invasive (the shipworm) inspired a national panic and led to the largest restructuring of water technology in centuries. Rather than an uninspiring and simplistic

⁶⁵ Jan Willem Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)* (Zwolle: Waanders, 1992); Toon Bosch, *Om De Macht over Het Water: De Nationale Waterstaatsdienst Tussen Staat En Samenleving, 1798-1849* (Zaltbommel: Europese Bibliotheek, 2000).

vision of decline, nature-induced disaster mirrored the richness of Dutch culture at the closing of the Golden Age.

Chapter Overview

This introduction to eighteenth-century Dutch “disaster” and “decline” is a framework upon which the remainder of the project will paint a fuller picture. Four case studies of discrete disaster events illuminate the environmental, economic, and cultural conditions of Dutch interpretation and response. Arranged chronologically, these analyses focus largely on the western Maritime Provinces of Holland, Groningen, Friesland, and Zeeland as well as the largely landlocked province of Utrecht. This choice was an attempt to compensate (even if only in degree) for the extreme imbalance in early modern scholarship favoring the province of Holland. Holland was one of seven official provinces during this period that constituted the Republic of the Seven United Provinces. (See Figure 1.4) The United Provinces was a confederacy forged by necessity during the Dutch Revolt against Habsburg Spain in the sixteenth century and endured (without the provinces in what is now Belgium) throughout the period of this study. Holland was the dominant provincial power during the entire period of the Dutch Republic, having the most political authority, largest population, most specialized agriculture, and greatest economic power (and tax burden).

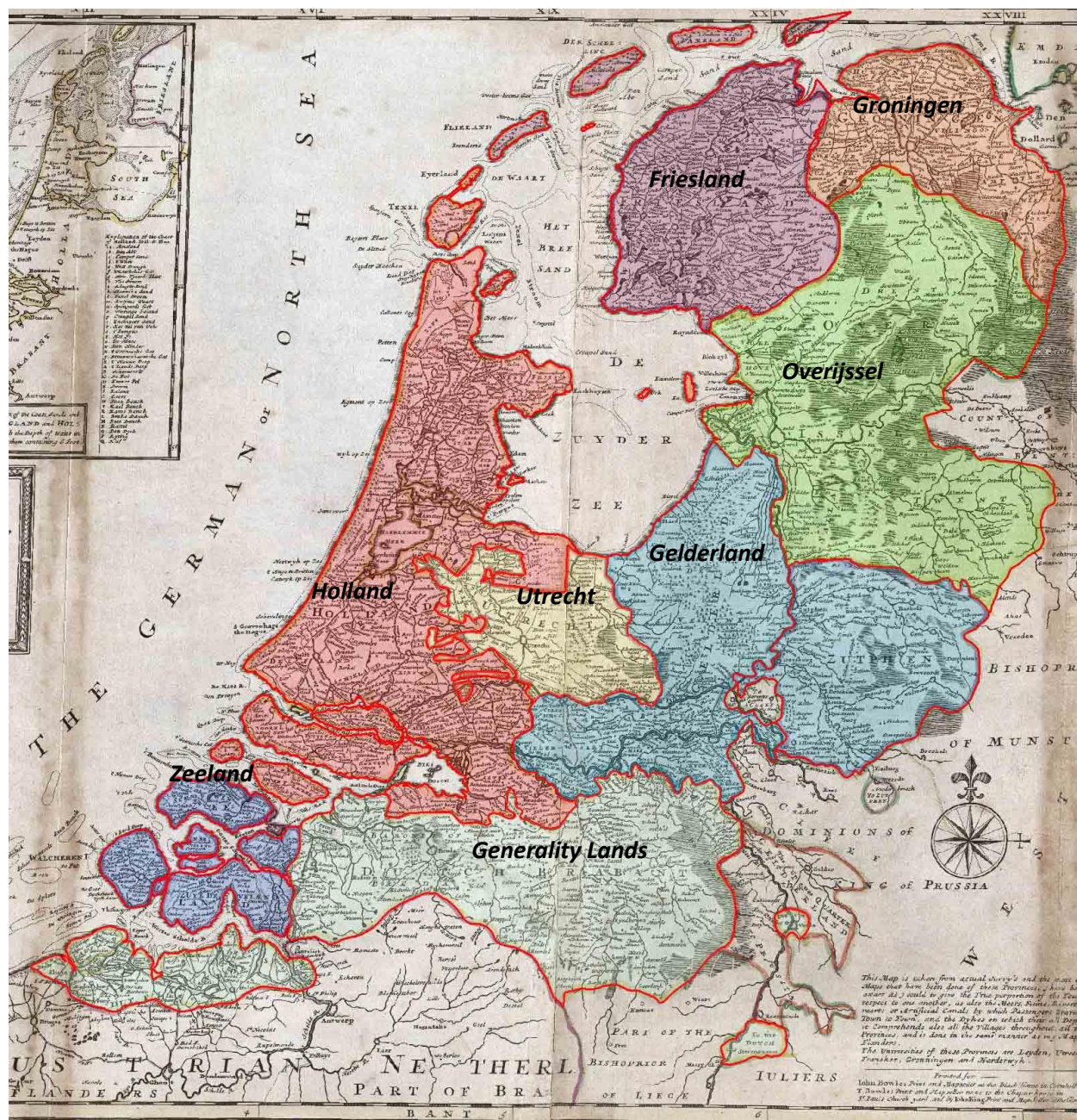


Figure 1.4 The Provinces of the Dutch Republic. This map highlights the decentralized character of the Dutch state. The Seven United Provinces of the Netherlands consisted of Holland (red), Utrecht (yellow), Friesland (Dark Purple), Groningen (Orange), Overijssel (Green), Gelderland (Light Blue), and Zeeland (Dark Blue). The national governing body (*Staten Generaal*) directly controlled several additional territories, called Generality lands (light green). Base Map: Herman Mol, "A New and Exact Map of the United Provinces of the Netherlands," 1710.

The pluralistic and decentralized condition of Dutch government and society during the early modern period underscores a common problem for historians of the Netherlands. Is it possible to speak of “the Dutch” in early modern history? Was there such a thing as “Dutch” disaster or decline? This project allows the sources to define the answer. In many cases, contemporaries foregrounded the decentralized character of the Netherlands. Most institutions managed and mitigated disaster on provincial (or local) scales. Narrative sources offer greater complexity. In the case of the Christmas Flood of 1717, some pamphleteers interpreted the flood as a regional or Groninger event. Hermannus Grashof, for example, published a pamphlet in 1718 describing the Christmas Flood as a disaster that affected “some provinces of the United Netherlands” and the Groningen minister Johan Mobachius published a sermon in 1718 on “The Land of Groningen’s very High and Terrible Flood.”⁶⁶ Other sources integrated the flood into larger narratives of “Dutch” history. Minister Hendrik Carolus van Byler and Ludolf Smids, for instance, included the flood of 1717 in their lists of “Dutch” coastal floods.”⁶⁷ Other more geographically widespread disasters like cattle plague engendered even greater attention to the

⁶⁶ Hermannus Grashof, *De Hand Gods Vitgestrekt Tot Tugtinge over Zommige Provintien Der Vereenigde Nederlanden, Bestaende in Zes Gedigten Van De Watervloed, in Kers-Nagt, Van 'T Jaer 1717: T'zamen Gestelt Voor De Godvrezende* (Groningen: Johannes van Velsen, 1718); J.A. Mobachius, *Groningerlands Zeer Hooge En Schrikkelyke Watervloed ... Op Kerst-Tyd Den 25 Decemb. 1717: Verhandeld ... Op Den Eersten Biddag, Gehouden in Groningerland, Den 5 Jan 1718. En Daar Na Uitgebreid, En Ter Gedagtenis in 'T Ligt Gegeven* (Groningen: Jurjen Spandaw, 1718).

⁶⁷ Hendrik Carel van Byler, *Enige Nederlandse Watervloeden, Nevens Een Lyst Van De Gene Die in 'T Jaer 1686, En Van Die, Dewelke in Het Jaer 1717. Op Kersdag Den 25 December Is Voorgevallen: Met Een Byvoeging Van Desselfs Aanmerkelijke Schade En Voorvallen. Zynde Hier Aangehegt Een Historis-Verhaal Van De Sterfte Die in De Vorige Eeuwen Onder Het Rund-Vee Geweest Is* (by Jurjen Spandaw, 1719). Ludolf Smids, *Diluviana of Daghwysen Der Nederlandsche Waternooden Van Het Jaer 793 Tot Deesen Laatste Van Den 25 November Des Verledene Jaars 1717* (Amsteldam: Hendrik vande Gaete, 1718).

national character of disaster.⁶⁸ Contemporaries interpreted disasters in local, provincial, and ‘national’ frames. This project maintains these distinctions.

The choice of case studies underscores the importance of offering a broad perspective on disaster in the Netherlands, but it also reflects what contemporaries considered the most catastrophic events. Floods, shipworms, and cattle plague received widespread and long-lasting attention. Each new disaster that referenced these events reinforced their discursive power over the imaginations and memories of the eighteenth-century Dutch. Focusing on these events allows this project to test the assumption that large disasters necessarily prompted the greatest transformation.

Each chapter introduces a new disaster event, contextualizing it in its cultural, environmental, economic, and long-term historical milieu. It also examines Dutch interpretation and response to disaster in the light of environmental change. The first three chapters introduce core ideas useful for interpreting early modern disaster more generally. These ideas include cultural memory, spiritual/secular interrelationships, causal storytelling, and novelty. While cultural memory has received previous treatment in historical disaster studies, causal storytelling is an underused topic that borrows from the political science of agenda setting to explain post-

⁶⁸ Scholars sometimes link Dutch disaster (particularly flooding) to broader cultural changes and Dutch historians have increasingly looked to disaster and the development of water management as mechanisms of state formation and nationalism. Flooding, and the shared vulnerability (and resiliency) in the face of disaster play a critical role in Simon Schama’s vision of Dutch culture, even in the seventeenth-century. Schama, *The Embarrassment of Riches : An Interpretation of Dutch Culture in the Golden Age*. Scholars usually reserve discussion of *national* state formation and the role of *waterstaat* (water governance) to the late eighteenth- and nineteenth-centuries, though elements of nationalism appear as early as the 1740-41 river floods in the form of national relief response. See: Bosch, *Om De Macht over Het Water: De Nationale Waterstaatsdienst Tussen Staat En Samenleving, 1798-1849*; "Hulpverlening Van Catastrofale Watersnoden in De Nederlandse Delta, 1740-1861," *Streven: Cultureel Maatschappelijk Maandblad* (2011): 509-20.

disaster decision-making.⁶⁹ Early modern disaster history frequently highlights secular and spiritual modes of interpreting and responding to disaster, though less frequently emphasizes their interdependency. Finally, early modern histories have demonstrated that fundamental concepts like curiosities, exoticness, and novelty grounded Dutch culture, commerce, and science.⁷⁰ Novelty inspired more than wonder and excitement. In the context of disaster, the “new” could also inspire fear and instigate dramatic change. Each chapter closes by examining the manner in which contemporaries incorporated discrete event into conceptions of a longer period of disaster. The concluding synthesis chapter steps back to consider how environmental disasters contributed to the overall period of Dutch decline.

Chapter One, entitled “Secular and Spiritual Therapies,” investigates this first severe eighteenth-century cattle plague epidemic in the provinces of Groningen and Holland between 1713 and 1720. It examines the symbolic and cultural importance of cattle in the Netherlands, issues that affected the interpretation and ultimate reaction to the disease. It also situates this cattle plague within larger Dutch trends of agricultural change that took place between 1650 and 1750 and interprets the plague as an agro-ecological consequence of the transnational cattle trade. This chapter characterizes Dutch response as both prophylactic and therapeutic and, as its

⁶⁹ Michael Kempe, "'Mind the Next Flood!' Memories of Natural Disasters in Northern Germany from the Sixteenth Century to the Present," *The Medieval History Journal* 10, no. 1&2 (2007): 327-54. C.K. Bos, S. Ullsberg, and P 't Hart, "The Long Shadow of Disaster: Memory and Politics in Holland and Sweden," *International Journal of Mass Emergencies and Disasters* 23(2005): 5-16; Christian Rohr, "Writing a Catastrophe. Describing and Constructing Disaster Perception in Narrative Sources from the Late Middle Ages," *Historical Social Research / Historische Sozialforschung* 32, no. 3 (121) (2007): 88-102; Christian Pfister, "The Monster Swallows You: Disaster Memory and Risk Culture in Western Europe, 1500-2000," *Rachel Carson Center Perspectives* 1(2011): 1-23. Deborah A. Stone, "Causal Stories and the Formation of Policy Agendas," *Political Science Quarterly* 104, no. 2 (1989): 281-300.

⁷⁰ Dániel Margócsy, *Commercial Visions: Science, Trade, and Visual Culture in the Dutch Golden Age* (Chicago: University of Chicago Press, 2014); Pamela H. Smith and Paula Findlen, *Merchants and Marvels: Commerce Science and Art in Early Modern Europe* (New York: Taylor & Francis, 2013).

core theme, argues that disease management depended on a suite of secular/spiritual remedies. These therapies could be contested or mutually reinforcing and depended on interpretations of disease drawn from the eighteenth century to antiquity. Institutions managed cattle movements, practitioners tested old and new medical techniques, and providential discourses promoted moral salves for what they interpreted to be a divinely ordained plague. Ultimately, the combined impact of this first cattle plague epidemic with concurrent natural disasters dictated its devastating outcome.

Chapter two, entitled “Fattened Land Turned to Salted Ground,” investigates the impact of a massive coastal flood on the province of Groningen. The Christmas Flood of 1717 extended across the North Sea basin, but in Groningen, the flood was the result of environmental change outpacing institutional adaptation. This case study highlights the deep history of flooding in the Netherlands and employs the core idea of cultural memory to explain disaster response. It demonstrates that provincial institutions, moralists, and an assurgent class of technocrats created causal stories (a second core idea) to harness interpretations of the past to direct flood response. However, the interrelated impacts of the Christmas Flood and previous disasters like the cattle plague restricted available solutions. Groningers overtly integrated the Christmas Flood into a period of disaster.

The third case study, “A Plague from the Sea,” examines the explosive outbreak of shipworms in the wooden barriers that protected Dutch coastal dikes. It highlights the response of the province of Holland, focusing on the reactions of natural historians, water managers, and ministers. Much like the Christmas Flood chapter, this chapter addresses the importance of rhetoric and causal storytelling – in this case the development of a new type of dike design. Novelty was a core concept that directed Dutch response. Providential interpretations employed

novelty as proof of divine intervention, scientists saw it as an opportunity for research and profit, and technocrats acknowledged the novel character of this water-based threat. This chapter argues that the shipworm epidemic instigated a more drastic response than other episodes of the disaster period because of the unique nature of the threat and, consequently, its absence from Dutch adaptive experience and cultural memory of disaster.

The final case study is a return to cattle plague, this time focusing on its impact in the provinces of Friesland and Utrecht during the second, even more severe epidemic that lasted from 1744-1764. Entitled “God’s Striking Hand,” it investigates changes and continuities in disaster interpretation and response since the first episode of cattle plague. It places particular emphasis on the developing science of animal medicine and explanations for increased mortality during the second epidemic. Rather than introducing a new core theme, this chapter tests their explanatory potential. The 1740s was also the nadir of the period of disaster due to the dense clustering of disaster events in the early part of the decade. These conditions were responsive to (and exacerbated) larger political and economic developments in the Dutch eighteenth century and ongoing cultural anxiety about Dutch “decline.”

The final chapter, “*Ongelukkige Tijden* – The Post Golden Age Period of Disaster,” places the period of disaster in the context of Golden Age decline. It summarizes the argument that the economic and cultural trauma of multiple, repeated disasters compounded pre-existing difficulties and directed adaptive response. Although the project’s case studies sample the most severe disasters of the early eighteenth century, numerous additional disaster events (famines, frosts, river floods, mouse plagues) punctuated this era. This final chapter integrates these events into the larger history of decline. Importantly, climate forged another connection during the period of disaster that went largely unrecognized by contemporaries. Many natural hazards

during this period of disaster were responsive to the highly variable climatic conditions between 1672 and 1764, a period defined by climate variability and intense clustering of extreme events. Contemporaries already linked these disasters together on economic, moral, and environmental levels. Climate was an additional, unrecognized, but powerful force that bound this period of disasters together at the closing of the Dutch Golden Age.

Chapter 2. Spiritual and Secular Therapies: Combatting Cattle Plague between 1713-1720

In 1713, the United Provinces of the Netherlands signed the Treaty of Utrecht ending their involvement in the War of Spanish Succession and overt hostilities with France. The Dutch Republic had been in a state of nearly constant war with France since Louis XIV's invasion of the Netherlands in 1672.¹ War had been only one element in a cluster of disasters that also included periodic and severe storms, floods, and frosts.² By the summer of 1713, the United Provinces prepared for a return to peace and prosperity. The *Staten Generaal* (the national governing body of the United Provinces) decreed a general day of thanksgiving and prayer on the 14 June 1713 “to offer our hearts and to thank God Almighty who through his grace and goodness saved Our State and blessed us with many great success in this recent War” as well as to “enjoy the desirous fruits of this good and holy peace...and stave off all other well deserved plagues.”³ Utrecht-born publisher François Halma had lived through the occupation of his home province by French troops during the *rampjaar* of 1672 and weathered the subsequent decades of dearth. In a pamphlet he published on the provincial day of thanks in the province of Friesland, Halma described the relief he and others felt after this long-sought declaration of peace. “Now

¹ The Anglo-Dutch war lasted from 1672-78; the War of the League of Augsburg (Nine Years War) lasted from 1688-97; and the War of Spanish Succession lasted from 1701-1713. See Appendix I.

² The most serious disasters of this era were the floods of 1686 and 1702; the “storm of the century” (of Daniel Defoe fame) in 1703; and the bitterly cold winter of 1708/09. Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 883-884; H. H. Lamb and Knud Frydendahl, *Historic Storms of the North Sea, British Isles and Northwest Europe* (New York: Cambridge University Press, 1991), 59-72.

³ Nicholaas Christiaan Kist, *Neêrland's Bededagen En Biddagsbrieven: Een Bijdrage Ter Opbouwing Der Geschiedenis Van Staat En Kerk in Nederland. De Nederlandsche Biddagsbrieven* (Leiden: Luchtmans, 1849), 301-302.

we thought we could take a breath,” he stated, “after being so long tortured and overburdened.”⁴ These high times were short-lived, however. That same month, the first reports of a new nature-induced disaster circulated throughout the Dutch Republic. A cattle plague panzootic that had ravaged eastern and southern Europe since 1709 arrived in the Netherlands.⁵

Between the first reports of the cattle plague in Holland in June 1713 and the last reports in 1720, cattle plague decimated herds across the Netherlands and across the continent. The disease, likely the *morbillivirus* rinderpest, was invasive and deadly. It burned through herds from Eastern Europe to England and reached the Netherlands via a circuitous route from Eastern Europe, through Italy and southern Europe, before emerging in the Baltic. Cattle plague during the early modern period spread through human networks of trade or warfare. These networks satisfied the appetites of the increasingly large armies and urban populations of early modern states. The transnational oxen trade between Denmark and Holland almost certainly provided the network that brought this outbreak of cattle plague into the Netherlands.⁶ (Figure 2.1)

⁴ François Halma, *Godts Wraakwaardt over Nederlandt, Vertoont in De Zwaare Sterfte Onder 'T Rundtvee* (Leeuwarden: François Halma, 1714), 8.

⁵ Clive A. Spinage, *Cattle Plague: A History* (New York: Kluwer Academic/Plenum Publishers, 2003), 104.

⁶ P. A. Koolmess, "Epizootic Diseases in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response," in *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*, ed. Karen Brown and Daniel Gilfoyle (Athens, OH: Ohio University Press, 2010). The chronology of the plague is outlined in Franciscus Cornelius Hekmeijer, *Korte Geschiedenis Der Runderpest: Benevens Eene Opgave Van Al De over Deze Ziekte Handelende Geschriften, Die Van De Vroegste Tijden Tot Op Heden Zijn Uitgekomen* (Amersfoort: Jacobs en Meijers, 1845). The most authoritative, modern account is Spinage, *Cattle Plague: A History*.

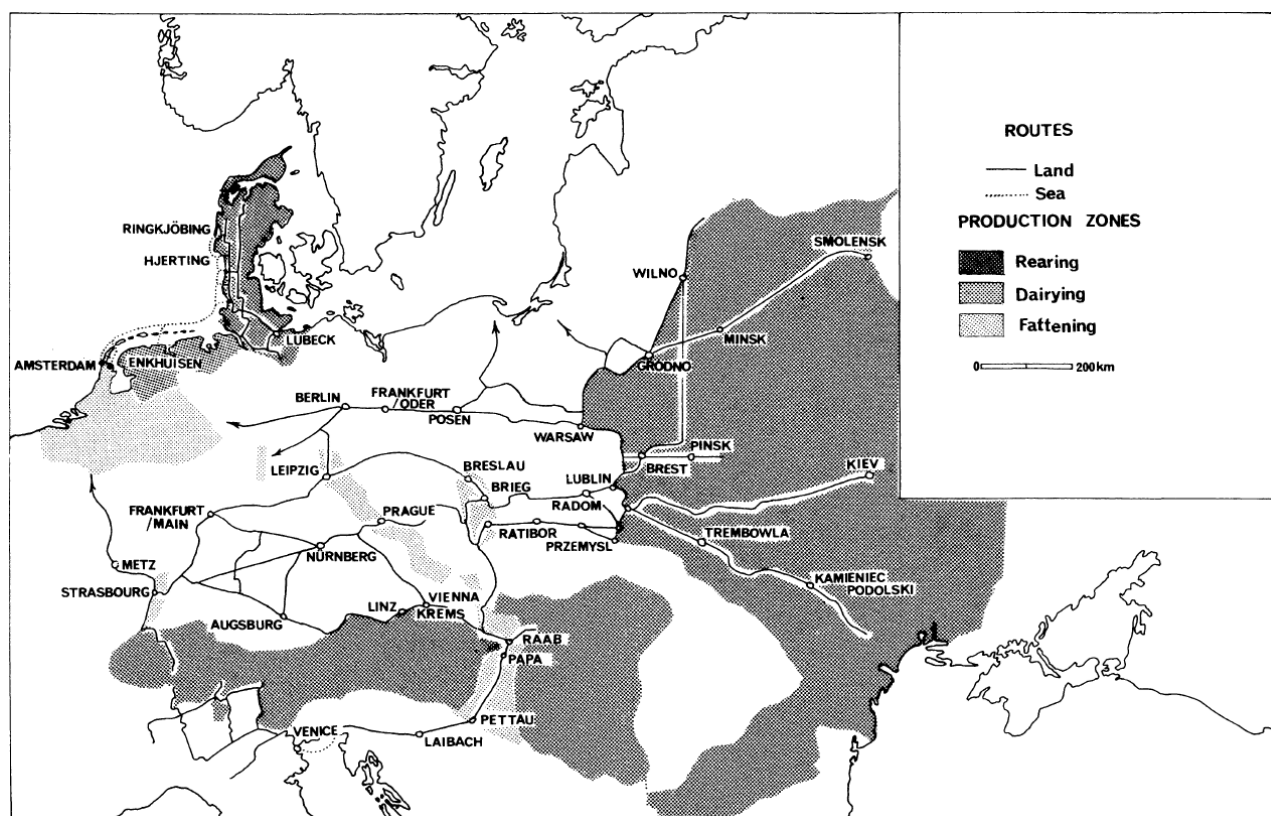


Figure 2.1 The transnational European Cattle Trade. The international cattle trade in oxen was expansive, though less united than this map would have it appear. The Dutch/Northern German/Danish trade did not have as many direct links to the rearing zones in Eastern Europe. From: Ian Blanchard, "The Continental European Cattle Trade, 1400-1600," *Economic History Review* 39.3 (1986)

The Dutch outbreak of 1713 was the first of three major cattle plague episodes in Europe during the eighteenth century and it was one of the most severe in early modern Dutch history. Livestock diseases in general were relatively common occurrences in early modern Europe, in fact, an epidemic of what was likely hoof and mouth disease had already struck the Dutch Republic in 1682.⁷ This disease was different, however. It struck with a catastrophic intensity that shocked contemporaries. If the disease was indeed rinderpest, morbidity may have been as

⁷ Ronald Rommes, "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw," *Jaarboek Oud Utrecht* (2001), 89.

high as 100% and mortality could range from 60 to 90%. The disease was characterized by fever, discharges from eyes and nose, blisters on the tongue, diarrhea, and finally death.⁸ Data about cattle mortality during this plague episode are not nearly as complete as later outbreaks and estimates place the number lost during the first period between 120,000 and 300,000.⁹ The first years of the plague had the highest mortality. Between 1713 and 1715 alone, 66,000 cattle died in Friesland.¹⁰ After Holland and Friesland, the third most important cattle fattening province was Utrecht, and although no similar figures exist, the decreasing income from taxes on cattle indicates losses of 35 to 40% in the province after the outbreak.¹¹ These losses seriously tested a population already burdened by the cumulative impact of decades of disaster and decline.

Cattle plagues were among the most devastating and costly disasters in the early modern Netherlands, but despite their significance, the Dutch Republic has never been a focus of research on eighteenth-century cattle plague. Most scholarship notes that Dutch responses to cattle plague were relatively ineffectual, especially when compared to effective eradication programs in England. Scholars often interpret the history of cattle plague as a process of gradual adaptation of affected populations leading to an eventual, successful eradication of the disease.

⁸ Spinage, *Cattle Plague: A History*, 5.

⁹ Koolmess, "Epizootic Diseases in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response," 23. The first estimate appears low considering the fact that the province of Holland alone lost 160,000 cattle during the markedly less severe outbreak of cattle plague in the 1770s. A.M. van der Woude, *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw* (H. Veenman en zonen, 1972), 585-593. The higher estimate comes from a 19th century source and has not been confirmed by modern scholars. Hekmeijer, *Korte Geschiedenis Der Runderpest: Benevens Eene Opgave Van Al De over Deze Ziekte Handelende Geschriften, Die Van De Vroegste Tijden Tot Op Heden Zijn Uitgekomen*, 6. This same source estimates that 1.5 million cattle died throughout Europe.

¹⁰ J.A. Faber, "Cattle Plague in the Netherlands During the Eighteenth Century," *Mededelingen van de Landbouwhogeschool te Wageningen* 62, no. 11 (1962), 2.

¹¹ These effects had staying power during the first epidemic. Tax income (*verpachting*) would not return to prior levels in Utrecht until 1723. Rommes, "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw," 105.

This type of analysis privileges narratives of progress that culminate in the eventual development of veterinary science and medicine. While cattle plague did prompt a reevaluation of disease in the Netherlands much as it did in other European countries, historians often treat the Dutch case as one of political indecision and conservative, rural aversion to developing techniques including mass culling of herds and inoculation.

The Dutch example should be reevaluated in view of the context of the era rather than eventual outcomes. Cattle plague was environmentally and economically significant, but the social construction of disease partly dictated its outcome. The disease organism was a hazard, but Dutch society turned it into a disaster. Dutch agriculturalists, provincial officials, and religious figures actively responded to the threat and eventuality of cattle plague. A diverse assortment of sources, from provincial resolutions to farmer's journals reveal a public deeply concerned with the consequences of the disease, its moral implications, and strategies to combat it.

This chapter investigates Dutch institutional, cultural, and economic responses to the first episode of cattle plague and highlights interpretations of cattle plague in order to tease out the meaning and motivations of Dutch response. Cattle were a potent symbolic and economic force to the early modern Dutch. Dairy cattle and to a lesser extent oxen, embodied Dutch fertility and prosperity. Plague inverted those symbols, replacing them with diseased bodies, barren fields and cattle markets as wellsprings of infection. In the Golden Age, cattle represented economic vitality. The evolving role of oxen in Dutch history reveals larger patterns in environmental change and a socio-economic relationship with cattle that necessitated animal movement. Plague undermined this system as those same networks that moved beef from Denmark to Dutch pastures, brought death and ruin.

These interpretations conditioned responses broadly based in spiritual and secular medicine that ranged from religious prophylaxes to the management of cattle movement. Animal medicine was nascent, but practitioners drew on analogies in human medical experience. Lastly, this chapter maintains that the Dutch interpreted these events in light of a larger period of disasters that preceded and continued during the cattle plague epidemic. Dutch institutional and narrative documents attest to the perceived connectedness of these disasters and demonstrate the economic and moral consequences of cattle plague amidst a period of disaster.

Cattle Plague: A Dutch Disease?

Cattle plague scholarship lies at the nexus of multiple emerging fields of scholarship including the history of the human relationship with animals, the history of medicine and science, and the environmental history of disease. The history of animals is an increasingly rich dimension of cultural and environmental history, although as historian Alan Mikhail has pointed out, the scholarly attention afforded animals relative to their ubiquity in human history (or perhaps because of it) remains low.¹² Two important dimensions of this field are animal disease and the development of animal medicine. Until recently, the history of animal medicine largely followed a similar pattern to the history of human medicine. It tended to focus on issues like the development of medical technologies, the eradication of disease, and the gradual overthrow of premodern medicine by rational science.¹³ This modernizing, positivist, “Whiggish” vision of

¹² Alan Mikhail, “Unleashing the Beast: Animals, Energy, and the Economy of Labor in Ottoman Egypt,” *The American Historical Review* 118, no. 2 (2013), 318.

¹³ Hubertus Cornelis Leonard Emile Berger, “De Ontwikkelingsgang Van Overheidsmaatregelen in Nederland Tegen Besmettelijke Veeziekten,” *Jaarboek der Rijksuniversiteit te Utrecht* (1930). Tjaart W. Schillhorn van Veen, “One Medicine: The Dynamic Relationship between Animal and Human Medicine in History and at Present,” *Agriculture and Human Values* 15(1998): 115-20; Reinhold A. Dorwart, “Cattle Disease (Rinderpest?): Prevention and Cure in Brandenburg, 1665-1732,” *Agricultural History* 33, no. 2 (1959): 79-85; C. R. Boxer, “The Dutch Economic Decline,”

progress privileges university-led medical discoveries and successful innovations in care. As a result, thorough historical treatments of animal medicine in Europe focus on the period after the establishment of the first veterinary schools in the late eighteenth century.¹⁴

The rise of the social history of human medicine, rural history, and the increasing interest in non-human histories have resulted in more socially and culturally informed attention to animal healing.¹⁵ Animal medicine existed long before the development of veterinary science and an increasing amount of scholarship deals with the substantial roles played by farriers, cattle doctors, and other practitioners of popular animal healing.¹⁶ Cultural histories of veterinary science, colonial histories of animal medicine, and histories of the pre-modern animal treatment are only a few of the emerging dimensions of this topic.¹⁷

in *Economic Decline of Empires*, ed. Carlo Cipolla (London: Routledge, 1970); Lise Wilkinson, "Rinderpest and Mainstream Infectious Disease Concepts in the Eighteenth-Century," *Medical History* 28(1984): 129-50.

¹⁴ Utrecht. Veeartsenijkundige Hoogeschool, *Een Eeuw Veeartsenijkundig Onderwijs: 'S Rijks-Veeartsenijschool, Veeartsenijkundige Hoogeschool, 1821-1921* (Utrecht: J. van Boekhoven, 1921); Cornelis Offringa, *Van Gildestein Naar Uithof: 150 Jaar Diergeneeskundig Onderwijs in Utrecht. 'S Rijksveeartsenijschool (1821 - 1918) ; Veeartsenijkundige Hoogeschool (1918 - 1925)* (Utrecht: Rijksuniv. te Utrecht, Fac. der diergeneeskunde, 1971); Lise Wilkinson, *Animals and Disease: An Introduction to the History of Comparative Medicine* (Cambridge: Cambridge University Press, 1992); Robert H. Dunlop and David J. Williams, *Veterinary Medicine: An Illustrated History* (Mosby, 1996). Henri Hours, *La Lutte Contre Les Épidémies Et L'école Vétérinaire De Lyon Au XVIIIe Siècle* (Presses Universitaires de France, 1957).

¹⁵ Mary Lindemann, *Medicine and Society in Early Modern Europe* (Cambridge: Cambridge University Press, 2010). Roy Porter, *Patients and Practitioners: Lay Perceptions of Medicine in Pre-Industrial Society* (Cambridge: Cambridge University Press, 2003). Marijke Gijswit-Hofstra, Hilary Marland, and Hans de Waardt, *Illness and Healing Alternatives in Western Europe* (New York: Routledge, 2013). Dominik Hünigler also explores this dimension in: Dominik Hünigler, *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten* (Neumünster Wacholtz Verlag, 2011).

¹⁶ Cornelis Offringa, "Ars Veterinaria: Ambacht, Professie, Beroep: Sociologische Theorie En Historische Praktijk," *Tijdschrift voor Geschiedenis* 96(1983): 407-32; Carsten Stühling, "Managing Epizootic Diseases in 18th Century Bavaria," in *Economic and Biological Interactions in Pre-Industrial Europe from the 13th to the 18th Century* (Florence: Firenze University Press, 2010); Dorothee Brantz, "'Risky Business': Disease, Disaster and the Unintended Consequences of Epizootics in Eighteenth-and Nineteenth-Century France and Germany," *Environment and History* 17, no. 1 (2011): 35-51.

¹⁷ Much of the colonial scholarship comes from Karen Brown and Daniel Gilfoyle. William Beinart and Karen Brown, *African Local Knowledge & Livestock Health: Traditional, Environmental & Biomedical Approaches in South Africa* (Oxford: James Currey, 2013); Daniel Gilfoyle and Karen Brown, *Frontiers of Knowledge: Veterinary Science,*

Histories of animal disease (particularly rinderpest) have also experienced an upsurge in scholarly attention. Disease scholarship often builds on its close relationship with the history of medicine and science, but increasingly, environmental history and the history of disaster have played important roles as well. Histories of animal medicine benefit from many of the insights developed in the context of human disease. In particular, both realms of scholarship have become increasingly critical of virgin soil models of disease transmission and mortality and more sensitive to the social construction of disease-as-disaster.¹⁸ Diseases were not exogenous variables that affected societies, but rather operated according to structures internal to them. In the case of cattle plague, disease was geographically variable. Plague had still not struck the town of Vreeswijk in Utrecht, for instance, even six months after its initial outbreak in the province.¹⁹ Mortality was also variable. In the Hasselt Parish of Overijssel, only 10.9% of cattle survived into 1714 and only 2.7% in the municipality of Staphorst.²⁰ In the eastern province (then called a *Landschap*) of Drenthe, cattle plague seemed to have been less virulent and by

Environment, and the State in South Africa, 1900-1950 (Saarbrücken: VDM Publishing, 2009); Karen Brown and Daniel Gilfoyle, *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine* (Athens: Ohio University Press, 2010); Richard Waller and Kathy Homewood, "Elders and Experts: Contesting Veterinary Knowledge in a Pastoral Community," in *Western Medicine as Contested Knowledge*, ed. Andrew Cunningham and Bridie Andrews (Manchester: Manchester University Press, 1997); Louise Hill Curth, *The Care of Brute Beasts: A Social and Cultural Study of Veterinary Medicine in Early Modern England* (Leiden: Brill, 2010); Joana Swabe, *Animals, Disease and Human Society: Human-Animal Relations and the Rise of Veterinary Medicine* (Taylor & Francis, 2002); Carsten Stühling, *Der Seuche Begegnen: Deutung Und Bewältigung Von Rinderseuchen Im Kurfürstentum Bayern Des 18. Jahrhunderts* (Lang, 2011); Hünninger, *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten*.

¹⁸ The seminal virgin soil works are Alfred W. Crosby, *The Columbian Exchange : Biological and Cultural Consequences of 1492* (Westport, Conn.: Praeger, 2003). William McNeill, *Plagues and Peoples* (New York: Knopf Doubleday Publishing Group, 2010). Criticisms can be found in Suzanne Austin Alchon, *A Pest in the Land: New World Epidemics in a Global Perspective* (Santa Fe: University of New Mexico, 2003); Paul Kelton, *Epidemics and Enslavement: Biological Catastrophe in the Native Southeast, 1492-1715* (Lincoln: University of Nebraska Press, 2007); David S. Jones, "Virgin Soils Revisited," *The William and Mary Quarterly* 60, no. 4 (2003): 703-42.

¹⁹ Rommes, "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw," 102.

²⁰ B.H. Slicher van Bath, *Een Samenleving Onder Spanning: Geschiedenis Van Het Platteland in Overijssel* (H.E.S. Publishers, 1957), 513.

1716, the income from taxation on horned animals had only decreased by 21%.²¹ This variability undoubtedly resulted from human land use patterns, the size and health of herds, and the proximity of herds to each other.²² Cattle plague highlights the power of a disease as an actor in history, but also its dependence on human networks.

If eighteenth-century European cattle plague can be classified as an affliction with a national character, this narrative certainly privileges stories from Italy, England, and France.²³ These were the countries that either benefitted from early historical interest in the subject or were at the forefront of the newly developing science of veterinary care. While this focus is appropriate in many contexts, it does a disservice to other national, regional, and local responses to the disease. The case of the Netherlands has much to offer scholars interested in the limitations imposed on disease management due to cultural, economic, and environmental factors. The socio-economic and environmental foundations of Dutch cattle production, the cultural importance of cattle, and the context of repeated disasters provides a particularly Dutch framework of understanding.

By extension, the early modern Dutch response to the plague is still a remarkably open area of research. In the disaster-prone context of the Dutch eighteenth century, it is perhaps understandable that a panzootic affecting much of Europe would elicit less interest than classically Dutch disasters such as river and coastal flooding, a shipworm epidemic, or even a

²¹ Jan Bieleman, *Boeren Op Het Drentse Zand, 1600-1910: Een Nieuwe Visie Op De "Oude" Landbouw* (Afd. Agrarische Geschiedenis, Landbouwwuniversiteit, 1987), 320.

²² J.A. Faber, *Drie Eeuwen Friesland: Economische En Sociale Ontwikkelingen Van 1500 Tot 1800* (Leeuwarden: De Tille, 1973), 466.

²³ One need only read the international or global treatments of the disease to determine the relative importance ascribed various regions. Spinage, *Cattle Plague: A History*.

secular “crisis” period in Dutch agriculture that ran roughly coterminous with these cattle plagues.²⁴ Indeed, as I will later argue, these subjects are intimately related. The Netherlands has an incredibly rich tradition of agricultural and rural economic scholarship, particularly from the “Wageningen School.” While little of the school’s work was dedicated specifically to cattle plague, many seminal regional and provincial studies touched on the significance of the cattle plague to rural economies.²⁵ Even these treatments, however, seem to largely meld cattle plague into one of a series of causal mechanisms forcing (or reflecting) agricultural crisis.

The recent influence of environmental history has had a subtle effect on scholarship. Few studies can be termed an “environmental history” of cattle plague. Two notable exceptions are the recent research of Dominik Hünninger and Karl Appuhn. Hünninger explores the impact of cattle plague in mid-eighteenth-century Schleswig-Holstein. Cattle plague worked at the intersection of environmental, socio-political, and economic considerations and played an

²⁴ Richard Tol and Andreas Langen, “A Concise History of Dutch River Floods,” *Climatic Change* 46, no. 3 (2000): 357-69; G.P. van de Ven, *Leefbaar Laagland: Geschiedenis Van De Waterbeheersing En Landaanwinning in Nederland*, International Commission on Irrigation and Drainage. Nederlands Nationaal Comité (Utrecht: Uitgeverij Matrijs, 2003); C. Baars, “De Paalwormfurie Van 1731-1732 En De Schade Aan De West-Fries Zeedijk,” *Waterschapsbelangen* 73(1988): 809-15; J. Mouthaan, “*Het Knaegen Der Wormen Aen De Paelen Der Nederlandze Zeedyken*”: *Reacties Op De Tereido Navalis in De Nederlandse Republiek Vanuit Cultuurhistorisch Perspectief, 1731-1735* (Zoetermeer: Free Musketeers, 2010); Johan de Vries, *De Economische Achteruitgang Der Republiek in De Achttiende Eeuw* (Leiden: Stenfert Kroese, 1968).

²⁵ Cattle plague made appearances in many of the seminal works of this school and focused in particular on the role of cattle plague within the scope of a secular trend in decline that lasted from roughly 1650-1750 in many areas of the Netherlands, particularly the Maritime Provinces. This subject came under increasing scrutiny by the school between the 1950s and 1970s. In Overijssel: B.H. Slicher van Bath, *Een Samenleving Onder Spanning: Geschiedenis Van Het Platteland in Overijssel* (Utrecht: HES, 1957); in Friesland: Faber, *Drie Eeuwen Friesland: Economische En Sociale Ontwikkelingen Van 1500 Tot 1800*; in North Holland: van der Woude, *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw*; and more recently in Drenthe: Bieleman, *Boeren Op Het Drentse Zand, 1600-1910: Een Nieuwe Visie Op De “Oude” Landbouw*. Importantly, Van der Woude argues that the “most serious crisis so far known to us in the history of Dutch agriculture” occurred between 1730 and 1755, which Van der Woude attributes to the combined impacts of the shipworm epidemic, cattle plague, and perhaps changing climate.(613)

important role in state formation.²⁶ Appuhn's article length work argues that the 1713 epizootic outbreak reveals the increasing importance of environmental interconnections between eastern and southern Europe. He links this environmental change to agrarian change, developing markets, and nutritional habits.²⁷

Similar work, though less explicitly environmental, is Wilhelmina Gijsbers' study of the rise and decline of the international cattle trade between Holland and Denmark. The particular social and environmental conditions of Holland vis-à-vis Denmark conditioned the latter to behave in much the same manner outlined in Appuhn's short article. Just as changing agrarian conditions in Italy led to greater dependency on imported beef, a similar situation (in this case related to specialized dairying in the polder lands of Holland) led to the development of international beef linkages to Denmark. Cattle plague in Holland, Gijsbers explains, was a result of these connections and at least partly responsible for their ultimate unraveling.²⁸

These "agro-ecological" dimensions of cattle plague are, therefore, an exciting and deepening subject of scholarship. They tend to congregate at the intersections of two levels of a framework for environmental history proposed by Donald Worster: those of reconstructing "historic natural conditions" and explicating their relationships to "modes of production."²⁹ The importance of these interconnections notwithstanding, a third, largely understudied (though

²⁶ Hünigler, *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten*. For a short overview of the dissertation in English, see: "Cattle Plague in Early Modern Germany: Environment and Economy / Knowledge and Power in a Time of Crisis," in *Elements - Continents. Approaches to Determinants of Environmental History and Their Reifications*, ed. Bernd Herrmann and Christine Dahlke (Stuttgart: Nova Acta Leopoldina, 2009).

²⁷ Karl Appuhn, "Ecologies of Beef: Eighteenth-Century Epizootics and the Environmental History of Early Modern Europe," *Environmental History* 15, no. 2 (2010): 268-87.

²⁸ Wilhelmina Maria Gijsbers, *Kapitale Ossen: De Internationale Handel in Slachtvee in Noordwest-Europa (1300-1750)* (Hilversum: Verloren, 1999).

²⁹ Donald Worster, "Transformations of the Earth: Toward an Agroecological Perspective in History," *Journal of American History* 76, no. 4 (1990), 1087.

equally significant) element of the human interaction with cattle plagues (per Worster's framework) is the realm of symbols, morality, and theology—three core concerns in this chapter.

This chapter focuses primarily on the ideological dimension from three angles. The first is the treatment of the cow itself. Cattle held an important, symbolic position in Dutch culture. Their illustration in text and image was multi-faceted and could potentially represent the condition of Dutch morality, the richness of the environment, or even symbolize the Netherlands as a whole. Conversely, disease could represent the inversion of these conditions and denote decline. The potent symbolic relevance of the cow in art and literature prompted contemporaries to interpret cattle plague as intrinsically Dutch, to consider the Dutch case particularly economically devastating, and it reinforced the Dutch conviction that cattle plague held providential implications specific to the Netherlands.

Another underappreciated dimension of cattle plague was medical. This is surprising because many of the earliest scholarly investigations of the disease focused exclusively on the history of medicine and science.³⁰ These works rarely escaped the triumphal narrative of an ever-improving scientific control of cattle plague, however. This tendency is particularly problematic in the case of the first episode of cattle plague precisely because contemporaries largely avoided innovation. Medicine during the first epidemic passed largely unchanged from previous epidemics, and animal care borrowed heavily from human medicine. Rather than rejecting Dutch medicine as static, however, this chapter examines why these techniques maintained their appeal.

³⁰ Hekmeijer, *Korte Geschiedenis Der Runderpest: Benevens Eene Opgave Van Al De over Deze Ziekte Handelende Geschriften, Die Van De Vroegste Tijden Tot Op Heden Zijn Uitgekomen*.

Finally, the ideological approach to cattle plague is also important because it further clarifies the reciprocal relationships between natural and economic changes. Economic decision-making (including coping strategies) depended on a defined realm of expectations, fears, and all manner of other interpretations of the natural world. The ideological approach is doubly important in the case of eighteenth-century cattle plague because coping strategies were not uniquely limited to a single threat. The Dutch conceived of cattle plague as one part of a larger series of disasters and the interpretation and subsequent coping strategies reflect that fact.

Economic and Symbolic Meaning of Cattle in the Netherlands

The cow was a potent symbol of wealth and prosperity in the northern Netherlands from the sixteenth century through the eighteenth. Its symbolic significance was directly derivative of its important role in the Dutch economy at large. Seventeenth-century historian Wouter van Gouthoeven, for instance, argued that “the richness of the land of Holland is daily witnessed and proved in the sweet potential and vast profits of trade and prosperity” which he attributed to three “mines or mountains of wealth.” The first was the herring fishery, but the other two sources of wealth in the Netherlands came from livestock, specifically the “horses, oxen, cattle and sheep hauled to markets from Holland” and “innumerable quantities of butter, cheese and other dairy found in Holland and traded throughout the world.”³¹ Agriculture was still the largest sector of the economy well into the eighteenth century and cattle were a central component of its

³¹ Wouter van Gouthoeven, *D' Oude Chronijcke Ende Historien Van Holland (Met West-Vriesland) Van Zeeland Ende Van Utrecht* (Dordrecht: Peeter Verhaghen, 1620), 6.

success.³² Dairy cattle supplied staple foods such as milk, butter, and cheese; oxen provided meat and the Dutch used both to produce products such as tallow, hides, horn, and manure.

Cattle's economic meaning was grounded in particular sets of changing environmental conditions, particularly regarding soil, water, and grass. In the coastal peat regions of the Netherlands, centuries of drainage for arable farming had oxidized the soil, resulting in subsidence and increased risk of flooding due to the lowered level of the landscape relative to surrounding water.³³ The developing specialization of agriculture into graziery, particularly in North Holland, led to intensive pasturing of cattle by the fifteenth century.³⁴ By the sixteenth century, northern Holland had become the one of the most important pasturing regions of northwest Europe for beef cattle. A thriving cattle trade developed where Danish and German-bred cattle were driven or shipped along the North Sea coast to Holland in order to fatten near urban centers.³⁵ After Holland instituted protectionist import restrictions in the late seventeenth and early eighteenth centuries, the Dutch in the eastern and northern provinces like Groningen

³² Jan de Vries and Ad van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815* (New York: Cambridge University Press, 1997), 195.

³³ Jan Bieleman, *Geschiedenis Van De Landbouw in Nederland, 1500-1950: Veranderingen En Verscheidenheid* (Meppel: Boom, 1992), 40-41.

³⁴ Jan Luiten van Zanden argues that farmers in Holland "were virtually forced to shift to cattle farming" because of the ecological degradation of the peat areas due to centuries of excavation and increasing flooding. Jan Luiten van Zanden, *The Rise and Decline of Holland's Economy: Merchant Capitalism and the Labour Market* (Manchester: Manchester University Press, 1993), 30; Wilhelmina Maria Gijsbers, "Danish Oxen in Dutch Meadows: Beef Cattle Trading and Graziery in the Netherlands between 1580 and 1750," *Facing the North Sea: West Jutland and the World; Proceeding of the Ribe Conference* (1993): 129-48.

³⁵ This system was a microcosm for larger scale linkages between urban centers in Western Europe and their peripheries. The two dominant sources for beef cattle in Europe were Hungary and Poland. The cattle breeding regions of Denmark and Schleswig-Holstein had more limited reach and supplied the Netherlands and some of Germany. W. Gijsbers and P. A. Koolmess, "Food on Foot: Long Distance Trade in Slaughter Oxen between Denmark and the Netherlands (14th-18th Century)," *Historia Medicinae Veterinariae* 26(2001), 115-116.

bred and drove cattle as well.³⁶ The sandy soils of inland areas like Drenthe supported very large numbers of cattle, primarily for breeding purposes before drivers pushed them to the sea clay regions of Groningen or Friesland for fattening.³⁷ Dairy cattle were also necessary in the clay soil conditions of Zeeland polders where arable farming was dominant. Farmers needed manure for crops and farmers fattened a limited amount of cattle in Zeeland pastures for VOC (Dutch East India Trading Company) voyages to the East Indies.³⁸ Cattle's roles depended on the variable environmental conditions of the provinces, but they were critical components of Dutch agriculture across the Netherlands.

Cattle symbols and narratives provide a window into the mentality of the early modern Dutch. They explain the power of providential interpretations of cattle plague and help visualize the importance of cattle as an economic force. In art, cattle scenes were a popular genre in the sixteenth and seventeenth centuries. This specialization was prompted in part by the large gains in pasturing land through inpoldering during the Golden Age. Reaching its height in the seventeenth century (notably via the work of Paulus Potter and Aelbert Cuyp) the genre idealized the Dutch countryside while at the same imbued the subject with realism hitherto unknown in Europe. Although not exclusively Dutch, cattle art experienced no similar enduring popularity elsewhere.³⁹

³⁶ A.M. van der Woude, *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw* (Utrecht: HES, 1983), 570.

³⁷ Bieleman, *Boeren Op Het Drentse Zand, 1600-1910: Een Nieuwe Visie Op De "Oude" Landbouw*.

³⁸ Peter R. Priester, *Geschiedenis Van De Zeeuwse Landbouw Circa 1600-1910* (Utrecht: HES, 1998), 244-254.

³⁹ Sjraar van Heugten, "Grazende Modellen: Aspecten Van Het Nederlandse Veestuk," in *Meesterlijk Vee: Nederlandse Veeschilders, 1600-1900*, ed. C. Boschma, et al. (Zwolle: Uitgeverij Waanders, 1988), 10.

Whether in text or image, the symbolic association of cattle with the Netherlands was undeniable in the early modern period. These associations had roots in the medieval era, but the Dutch revolt in the sixteenth century expanded these meanings.⁴⁰ Some of the earliest and most striking evidence of the growing importance of cattle on a cultural level are found in material culture. Foreign observers depicted the Low Countries as a “fattened cow” in political allegories. (Figure 2.2) The cow represented the wealth and strategic opportunity available to European powers able to control the resources of the Low Countries on the eve of the Dutch Revolt. The below image, for instance, satirically depicts Queen Elizabeth I of England, King Phillip II of Spain and William of Orange each attempting to control, cajole, or “milk” the wealth of the Low Countries. The “exploitation” of the cow (more so than the ox) was a common trope in Dutch visual and literary culture, especially during the Golden Age. Cattle could offer positive or negative associations. They signified personal and communal wealth, the richness and fertility of Dutch agriculture, and the positive connotations associated with an exploited, but well-managed Arcadian landscape.⁴¹ These images offered a cornucopian analogy that blended the economic with the symbolic. Conversely, they could signify an exploitative political position (as in the *melkkoetje* painting), or with the coming of cattle plague or floods, dead cattle bodies could signify the condition of lost wealth, poverty, and a diseased economic state.

⁴⁰ C. Boschma, *Meesterlijk Vee: Nederlandse Veeschilders 1600-1900* (Zwolle: Waanders, 1988).

⁴¹ Alison McNeil Keetering, *The Dutch Arcadia: Pastoral Art and Its Audience in the Golden Age* (Allanheld and Schram, 1983). Arcadia in Dutch visual culture indicated a human-controlled, pastoral idyll.

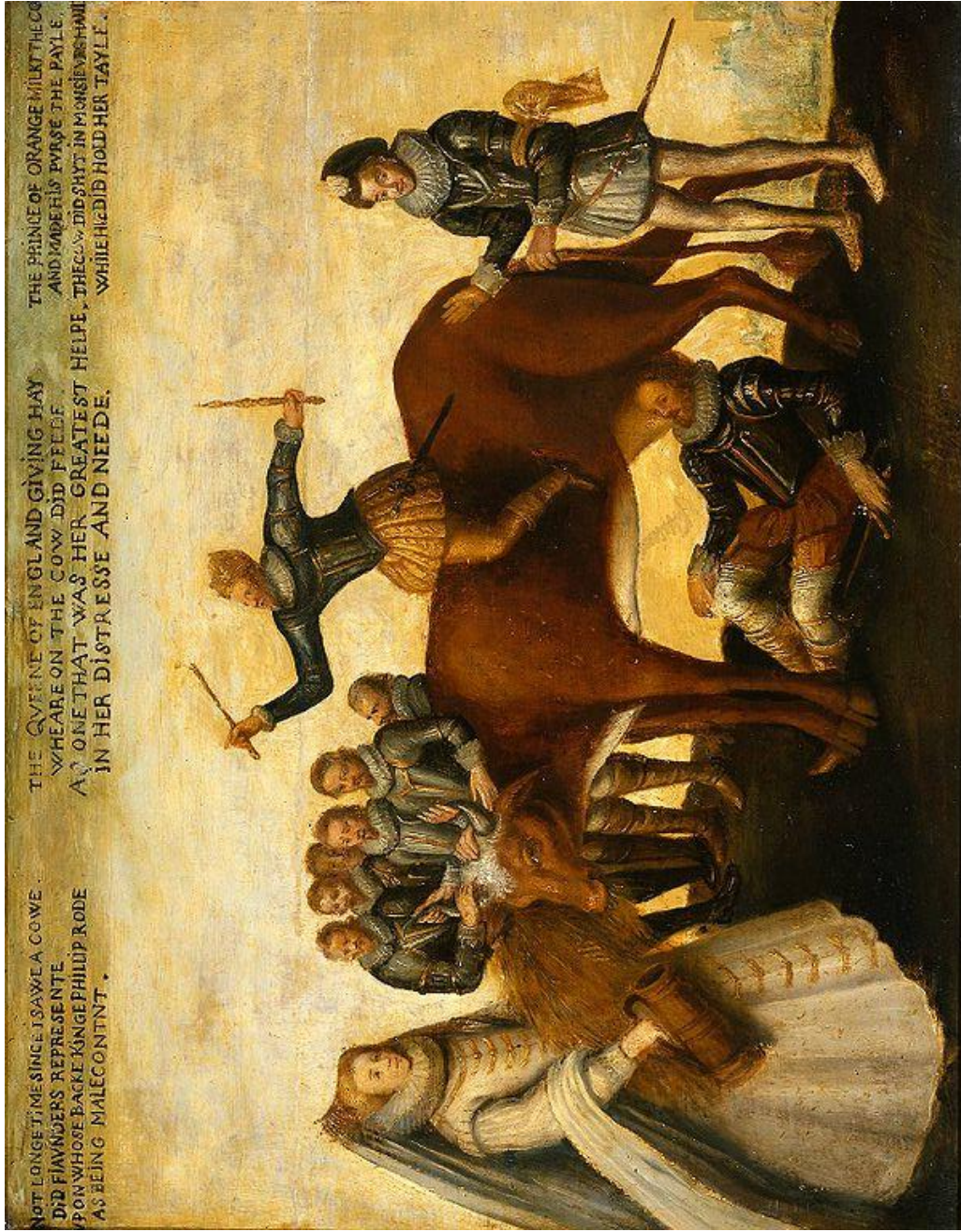


Figure 2.2 Anon. The Milk Cow: Satire on the Exploitation of the Netherlands by the Prince of Orange (*Het melkkoetje: satire op het uitbuiten der Nederlanden door de prins van Oranje*), ca. 1633 - ca. 1639, Rijksmuseum, Amsterdam. Cattle frequently symbolized the fertility and wealth of the Netherlands, though the positive connotations could be inverted by emphasizing the domesticated and exploited condition of dairy cattle.

Many contemporaries noted the significance of cattle as it related to wealth. To a great extent, cattle *were* wealth, especially in the countryside. François Halma, in his pamphlet describing plague in Friesland, referred to cattle as “the silver mine of Friesland’s fertile land.”⁴² Conversely, the loss of cattle to disease signaled a serious loss of income that portended increasing hardship. In a poem entitled “Gods Judgments over the Netherlands,” moralist Is Centen explained that upon the arrival of cattle plague, “the farmer sees shortly his cattle, his wealth, entirely robbed, and looks with jaded sadness, with wife and tender offspring on the ability to preserve their lives.”⁴³ Cattle plague directly threatened the livelihoods of more than just farmers. The specialized nature of cattle production in the Netherlands and the market for cattle products necessitated a wide variety of professions, from cattle breeders, grazers, and dairy farmers, to cattle traders, shoemakers, and tanners. Consumers demanded milk, cheese, beef, and textile bleachers needed the lactic acid in buttermilk to whiten their cloth. Tobacco farmers and agriculturalists growing other nutrient-hungry crops needed cattle manure to fertilize fields.⁴⁴ Cattle disease undermined the foundation of each of these individual industries.

Contemporaries created symbolic and material connections between cattle production and regional and provincial wealth as well. On a symbolic level, cattle plague created a rift with the past. Referring to Groningen as “Lovely Arcadia-Nature’s valued gift,” Reformed minister Hendrik Carel van Byler proudly proclaimed that his home was at one point filled “as far as the

⁴² Halma, *Godts Wraakzwaardt over Nederlandt, Vertoont in De Zwaare Sterfte Onder 'T Rundtvee*, A2.

⁴³ I. Centen, *Gods Oordelen over Nederland, in De Sterfte Van't Rundvee, Den Zwaren Storm, En Hogen Watervloed*, vol. 16413 (Amsterdam: Johannes Oosterwijk, 1718), 4.

⁴⁴ Ronald Rommes, “Twee Eeuwen Runderpest in Nederland (1700-1900),” *Argos: bulletin van het Veterinair Historische Genootschap* 31(2004), 35.

eye can see with fattened cattle that grew as plentifully as sand in the sea.”⁴⁵ Naturally, the memory of this pastoral sharply contrasted with its new condition, which Van Byler declared “now lays wasted.”⁴⁶ The multitude of dead cattle and difficult dairying seemed patently at odds with a remembered past when “butter and cheese [were] nature’s fruits of the Netherlands.”⁴⁷ Cattle plague symbolized the decline of natural wealth in provinces and the Netherlands at large.

On a material level, many provincial governments relied on cattle production for revenue. Provincial systems of taxation varied, but most imposed multiple taxes on farmers and many directly taxed the number of animals owned (called *hoorngeld*). Cattle undermined the tax farming system that supported provincial governments in two ways. Plague decreased the total number of taxable animals. It also created an economic condition whereby individual farmers could not afford other forms of taxation. Friesland, for instance, had a land tax (called a *floreen*), a suite of direct taxes (*vijs speciën*) among which was *hoorngeld*, as well as a tax on real property instituted in 1711 called the *reële goedschatting*.⁴⁸ The provincial body of representatives for Friesland (*Staten van Friesland*) recognized the deleterious effect that the plague had on their ability to collect these taxes as early as 1714. “The greater parts of these good inhabitants have lost all of their animals,” a resolution on 10 March stated, “and many others are not able to pay the *floreen* rent or other aforementioned taxes.” The resolution also ordered municipalities and cities to provide precise numbers of dead cattle so that the province could determine “in what

⁴⁵ Hendrik Carel van Byler, *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. (Groningen: Jurjen Spandaw, 1719), 59.

⁴⁶ *Ibid.*, 59.

⁴⁷ Jan Smit, *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit* (Amsterdam: Steven van Esveldt, 1745).

⁴⁸ De Vries and van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815*, 213.

manner this defect in the lands finances would result.”⁴⁹ Cattle plague was a financial problem for provinces as much as individuals.

Cattle markets had a large part to play in the economic and symbolic importance of cattle to the Dutch Republic as well. The Netherlands sat at the intersection of a regional and international cattle trade that extended to Germany and Denmark in the North and East and Flanders to the South. Cattle markets in northern Dutch towns such as Hoorn, Haarlem, and the Zuiderzee port of Enkhuizen were the central nodes of networks of cattle movement, which in the case of oxen, stretched across Europe.⁵⁰ The rapid urbanization of the Netherlands between the sixteenth and eighteenth centuries depended on the animals sold at these markets to feed their growing populations.

Just as individual cattle represented wealth and cattle-filled pastures embodied the fertility of entire regions, cattle markets were symbolically rich meeting grounds of economic and cultural meaning that frequently prompted cornucopian associations. No location more potently visualized the connection between cattle and profit than these markets and their connection to the richness of Dutch *terra* should not be understated. (Figure 2.3) This print by Jan van der Velde highlights the connection between wealth and the land. Richly clad buyers haggle with “bristly rural farmers” over this “show of wealth of their land” while surrounded by fat cattle and other agricultural products.⁵¹ The market stands at the entrance to the city whose buildings crowd the left of the print and was the emblematic meeting ground between

⁴⁹ *Resolutie (10 Mar) 1714*. Gewestelijke bestuurstellingen van Friesland 1580-1795. 5. 253. TRESOAR, 62-63.

⁵⁰ Gijsbers, *Kapitale Ossen: De Internationale Handel in Slachtvee in Noordwest-Europa (1300-1750)*, 33-40.

⁵¹ From the Latin inscription to Jan van de Velde naar Willem Buytewech, *Terra*. (Elementen). Translated by author.

agricultural wealth and urban prosperity. The hustle and bustle of this exterior scene pleasantly contrasts with the pastoral landscape behind it.



Figure 2.3 Jan van de Velde naar Willem Buytewech, *The Elements (Terra)*, 1622. Van de Velde's print depicts the meeting ground between the rural and urban and the transfer of wealth from an Arcadian landscape in the right background to the commercial/urban cityscape in the left background.

In contrast, the coming of the plague reversed this analogy and compounded the misery of the disaster, especially for the lower classes. Noting the unequal distribution of affliction, Centen declared that the “miserly market in dairy, meat, and butter only makes this disaster all the worse for the poor.”⁵² This class dimension of cattle plague is a relatively understudied phenomenon, though there is evidence that cattle plague in the countryside elevated food prices by freezing the international cattle trade, greatly reducing stocks available for sale in urban areas.⁵³

The location of cattle markets partly explains the trajectory of this early epidemic as well. It was no coincidence that the outbreak of June 1713 began in Amsterdam. In the mid-seventeenth century, the coastal town of Enkhuizen housed Holland’s primary cattle market. Enkhuizen, like many towns in North Holland however, suffered greatly during the secular economic depression in the second half of the century and by the 1650s, the market moved to Amsterdam permanently.⁵⁴ Danish oxen arrived by boat or on long cattle drives across northern Germany and the eastern Netherlands. Already in 1714, Dutch observers connected the arrival of the plague to cattle markets and Danish oxen. It was “through Danish oxen that this evil was introduced to the beasts in our Fatherland,” one anonymous author noted, and they were “so hastily driven...and brought to market, and thereafter to the stalls...that the disease was spread, and the death was speedily worsened, so that now few escape.”⁵⁵ Regional markets were no less

⁵² Centen, *Gods Oordelen over Nederland, in De Sterfte Van't Rundvee, Den Zwaren Storm, En Hogen Watervloed* (Amsterdam: Johannes Oosterwijk, 1718), A4.

⁵³ Rommes, "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw", 89.

⁵⁴ Gijsbers and Koolmess, "Food on Foot: Long Distance Trade in Slaughter Oxen between Denmark and the Netherlands (14th-18th Century)," 117.

⁵⁵ Anon., *Bedenkingen, En Raad, Noopende De Tegenwoordige Sterfte Onder Het Rundveeb* ('s Gravenhage: Pieter van Thol, 1714), 5-6.

susceptible. The Frisian cattle farmer Jan Wopkes, for instance, noted the plague at the yearly market in the town of Wommels. “Very many cattle died at Wommels,” he noted in his journal, “it is hard to find one house that is now free of this evil sickness.”⁵⁶ The same markets that had fostered economic prosperity and symbolized fruitfulness and wealth in centuries past became vectors of disease in 1714.

The economic significance of cattle was no doubt paramount, but even the most pragmatic agriculturalist would have found it difficult to disengage the dramatic mortality of his herd from more esoteric considerations. The dominant reaction to the plagues was therefore providential. Providentialist interpretations developed out of a long tradition of the moral reading of disasters in the Netherlands and they remained a powerful force into the nineteenth century. Many protestant ideologies in the Netherlands posited that God intervened in community life and interpreted disasters, including cattle plague, as proof of his presence. Revealed theology (the Bible) and natural theology (evidenced in nature) proved God’s grace and concern for human welfare and morals.

The Dutch held this view broadly during the Golden Age, but it exhibited subtle changes in the early eighteenth century. The most significant change was the development of physico-theology, which employed systematic observation and reason to examine nature and prove God’s providence. This was an international movement, but in the Netherlands it was a conservative response to Cartesianism and especially Spinozism, neither of which required constant divine

⁵⁶ J.J. Spahr van der Hoek, *Geschiedenis Van De Friese Landbouw*, vol. 1 (Drachten: Friesche Maatschappij van Landbouw, 1952), 218.

attention.⁵⁷ Works like Bernard Nieuwentijdt's 1715 publication, "The right use of the contemplation of the world for the convincing of atheists and unbelievers," popularized these beliefs and ensured the continued vitality of natural theology and providence.⁵⁸ They also reinforced the popular conviction of God's centrality in explanations of environmental change. Although nascent during this epidemic, the physico-theological reading of disaster developed in importance over the eighteenth century.

The vast majority of literature imparted a moral or theological meaning to these disasters and related cattle plagues to human sin. They either explicitly or implicitly argued that the Netherlands was experiencing decline and that it had strayed from a righteous path. God as shepherd to His flock was a well-known analogy, but Dutch literature sometimes ascribed similar moral metaphors to cattle and their keepers. In his "Beehive of the Conscience" (*Bijkorf des gemoeds*), the famous moralist, poet, and illustrator, Jan Luyken drew moral and scriptural meaning from the domesticated and dependent condition of livestock. Without God's guidance, humanity would be (spiritually) lost.⁵⁹ The foolishness and forgetfulness of calves, depicted repeatedly falling into moats, represented the tendency of people to forget lessons and fall into

⁵⁷ For more on the relationship between natural theology, physic theology, see: Eric Jorink, *Reading the Book of Nature in the Dutch Golden Age, 1575-1715*, trans. Peter Mason (Leiden: Brill, 2010). Nieuwentijdt's arguments saw little resistance from the conservative Reformed establishment. Cornelis Huisman, *Neerlands Israël: Het Natiebesef Der Traditioneel-Gereformeerden in De Achttiende Eeuw* (Dordrecht: J. P. van den Tol, 1983), 36.

⁵⁸ Bernard Nieuwentijdt, *Het Regt Gebruik Der Werelt Beschouwingen Ter Overtuigingen Van Ongodisten En Ongelovigen* (Amsterdam: Joannes Pauli, 1714).

⁵⁹ Jan Luyken, *De Bykorf Des Gemoeds, Honing Zaamelende Uit Allerly Bloemen. Vervattende over De Honderd Konstige Figuren. Met Godlyke Spreuken En Stichtelyke Verzen.* (Amsterdam: P. Arentz and K. van der Sys, 1711), 126.

evil.⁶⁰ The adult cow was a reminder of the Fall; its domesticated condition a reminder of humanity's former universal dominion over animals. (Figure 2.4)

⁶⁰ Ibid., 330.

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D E K O E.

Schuw voor minder schyn quaad.



*Want als de HEERE God, uit der aarden alle 'i
gedierte des velds, en al 't gevogelte des hemels gemaakt
badde, zo bragt hy ze tot Adam, om te zien hoe hy ze
noemen zoude: en zo als Adam alle levendige ziele noe-
men zoude, dat zoude zyn naam zyn. Genezis II: 19.
D'on-*

Figure 2.4 Jan Luyken, *The Beehive of the Conscience* (*De Bykorf Des Gemoeds, Honing Zaamelende Uit Allerly Bloemen. Vervattende over De Honderd Konstige Figuren. Met Godlyke Spreuken En Stichtelyke Verzen*) Amsterdam: P. Arentz and K van der Sys, 1711, 278. Moralists often used animals allegorically, including the cow which Luyken associated with the Fall.

Cattle plague also inspired providential interpretations. Dutch moralists interpreted all three epizootics of the eighteenth century as punishments for human sin.⁶¹ Just as with other disasters, the Bible was the first source for evidence of causation and meaning. The association of Dutch cattle with wealth led to obvious associations to the “Golden Calf” of the Old Testament. Perhaps for this reason, moralists often linked plague to the sin of idolatry. Providentialists also proffered familiar passages from Exodus or Psalms relating to the plagues of Egypt to explain the presence of eighteenth-century plague.⁶²

Perhaps because Exodus offered little in the way of specific instruction for the pious reader, sermons and pamphlets had an open field when tying disasters to the specific sins of the Netherlands. In his poem “Humbled Netherlands, or Lamentations over Dutch Sins,” Johannes Sluiter, a minister in Overijssel, attributed the cattle plague to “pomp and splendor, drunkenness and foul language.”⁶³ East Frisian minister Jacob Harkenroht added “idolatry, forgetting the word of God, insensitivity, excess and waste” to the list of responsible sins.⁶⁴ Authors frequently couched sins in the history of a region (in this case the Frisian areas of the Netherlands and Germany). Harkenroht took pains to connect the agrarian character of this region to biblical

⁶¹ For more on the providential association of cattle plague with human sin, particularly during the second and third epidemic, see: Jan Willem Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)* (Zwolle: Waanders, 1992).

⁶² Taken from Exodus 9:3 of the State translation of the Bible. With the sixth plague, Moses promised that God “shall bring a terrible pestilence of your livestock in the fields, or the cattle and the smaller animals” (*sal zijn over u vee dat in 't velt is, ...over de runderen, ende over het kleyn vee: door eene seer sware pestilentie*). Anon., *Biblia, Dat Is: De Gantsche H. Schrifture (Statenvertaling 1637)* (Leiden: Paulus Aerts van Ravensteyn, 1637), pg. 4v.

⁶³ Johannes Sluiter, *Vernedert Nederlant, of Klage over Nederlants Sonden, Gestraft Door De Sterfte Van Het Rundervee* (Steenwyk: Pieter and Hendrik Stuyfzant, 1715), 5.

⁶⁴ Jacobus Isebrandi Harkenroht, *Kerkreede over Oostfrieslands Rundvees Pest, Gevreest, En Helaas Gekoomen, Aangeetoont Uit Jes: Vii. Vs. 21. ... Op Een Maandelijke Bededag Aan De Gemeente Te Larrelt in Oostfriesland*, vol. 16305 (Emden: Enoch Brantgum, 1716), 25-27.

counterparts. As with most punishment sermons (*strafpredicaties*) from this era, however, sins were also general enough to be applicable on a regional or national scale.

Finally, commenting on the first wave of epidemics, Harkenroht offered an interpretation of Isaiah 7:21 that foretold future disaster.⁶⁵ This cattle plague, like the biblical plagues, was a warning of “more terrible disasters.”⁶⁶ Harkenroht easily justified this interpretation with reference to the recent history of the northern Netherlands, which had been subjected to multiple disasters. Memory of past and recent disasters and recognition of divine influence over the present were keys to preventing future occurrences. Harkenroht and many of his contemporaries thought this plague was only a prelude. Whether depicted in images, described in poems, or referenced in sermons, the cow was a potent and particularly Dutch symbol and barometer of God’s providential favor. In the Golden Age past, it had represented wealth, health, and a favorable relationship with God and their environment. After 1714, the dead and diseased bodies of cattle were forceful reminders of, not only their past condition of divine grace and nature’s bounty, but also their current condition and future hardships.

Cattle Plague Responses: Public Health and Cattle Movement

Protecting these symbolically and economically valuable Dutch herds from plague required multiple strategies. Public health regulations were the most visible means of tackling disease. The specific mechanisms for controlling outbreaks varied between provinces, but most regulation occurred on the provincial scale with smaller administrative districts assuming

⁶⁵ Isaiah 7:21, “Ende 'tsal geschieden te dien dage, dat yemant een koeyken in't leven sal behouden hebben, ende twee schapen.” (It shall happen in that day that a man shall keep alive a young cow, and two sheep). Anon., *Biblia, Dat Is: De Gantsche H. Schrifture (Statenvertaling 1637)*.

⁶⁶ Harkenroht, *Kerkreede over Oostfrieslands Rundvees Pest, Gevreest, En Helaas Gekoomen, Aangetoont Uit Jes: Vii. Vs. 21. ... Op Een Maandelijke Bededag Aan De Gemeente Te Larrelt in Oostfriesland* (Embden: Enoch Brantgum, 1716), 7.

responsibility for enforcement. They were also responsible for the financial accounting of cattle deaths. In Friesland, for instance, *grietenijen* (municipalities) reported the number of cattle killed to the province for the purpose of tax remissions. Provincial deputies printed regulations and announcements, which they displayed in public places, oftentimes in churches. A January 1714 provincial proclamation in Groningen, for instance, ordered clergymen to read their new restrictions aloud during religious services in addition to placing the documents in public view so that “nobody may claim any ignorance.”⁶⁷ Churches and provinces worked together to publicize and manage the disaster.

Public health regulations focused on managing the movement of cattle and were in keeping with contagionist and environmental models of disease.⁶⁸ Precautions against cattle plague developed out of public health regulations at least as old as the Black Death in the medieval era and included the careful monitoring and control of disease entering and exiting protected spaces.⁶⁹ Public health documents reveal that provinces worked under the supposition that cattle plague spread from animal to animal (including animal products) or humans to animals. This is evident in the most common qualifiers for cattle plague: either *contagieuse* or *besmettelijk*, both of which denoted contagion. Cattle plague might also develop out of infected air (called miasmas) and provinces distributed printed instructions how to purify miasmatic environments. In the eighteenth-century Netherlands, provinces assumed primary responsibility

⁶⁷ *Resolutie (4 Jan)* 1714. Staten van Stad en Lande. 1. 477. Groninger Archieven.

⁶⁸ Dorothee Brantz argues that contagionist model slowly overtook miasmas over the course of the eighteenth century. This may have been true in the Netherlands by the end of the century, but through the first two-thirds, both models maintained importance. Brantz, "'Risky Business': Disease, Disaster and the Unintended Consequences of Epizootics in Eighteenth- and Nineteenth-Century France and Germany."

⁶⁹ Stühling, "Managing Epizootic Diseases in 18th Century Bavaria," 476.

for managing disease and as a result, management varied in timing and strategy. Most provinces, however, instituted local quarantines, certificates of travel, and general restrictions on the import and export of cattle. Each of these techniques had precedents in human disease management and Dutch institutions quickly adapted those regulations to cattle.

The cattle economy, as much as the plague itself, depended on the movement of animals, however. Conflict over provincial regulation developed out of the dual necessity of facilitating animal movement for economic purposes, and restricting movement for disease management. The international oxen trade, for instance, transported cattle reared in Danish and German pastures to the Netherlands for fattening and slaughter. These connections established an efficient source of meat for the increasingly urbanized and prosperous populations of the coastal provinces of the Netherlands.⁷⁰ This same international trade in oxen opened up new possibilities for the expansion of disease. The cattle economy transported a plague that was enzootic (non-human endemism) to the steppes of central Asia and Russia across Europe and into the Netherlands.⁷¹

On a smaller scale, movement was the foundation of the Dutch cattle economy as well. Harsh weather and seasonal shifts in grass production forced farmers to move their cattle between pastures and stalls. This movement was a strategy to manage hay availability during the meager winter months. The longer farmers could keep cattle in the fields, the greater their hay supplies would be by the end of the winter. The Frisian Farmer Jan Wopkes, for instance, noted

⁷⁰ Gijssbers, "Danish Oxen in Dutch Meadows: Beef Cattle Trading and Graziery in the Netherlands between 1580 and 1750," 133.

⁷¹ Observers of rinderpest from the eighteenth-century onward noted the disease's likely origin in Russia. Rinderpest has no carrier species, but displays milder symptoms in Russian Steppe Oxen. Spinage, *Cattle Plague: A History*, 23.

that he had already moved “all milk cows into the fields” on April 16, 1711 because of the “wonderful grass” available.⁷² A local perspective also highlights the relationship between cattle movement and disease. While spring 1711 was mild, poor weather conditions in 1713 and 1714 delayed Wopkes from moving his cattle to the pastures by almost two weeks.⁷³ These two weeks were critical, as the cattle must have been running low on feed when the plague entered the Netherlands in 1713. Climate and geographic location are the two most significant influences on livestock production and their effects on the availability of resources like food influence a variety of diseases.⁷⁴ Climate worked in a suite of environmental and social factors that contributed to the initial severity of the disease.⁷⁵

The movement of cattle into close quarters during the winter also played a role in the severity of cattle plague. Cattle mortalities were highest in the winter when farmers moved cattle to stalls and kept them in close quarters.⁷⁶ Contemporaries recognized the seasonal character of the disease as well as the increasing vulnerability of their animals, though they attributed higher mortality to environmental factors rather than contagion. Stalls were damp, miasmatic environments and many secular therapies for cattle plague addressed these environmental

⁷² Jan Wopkes. *Aantekeningen Van Jan Wopkes, Boer of Koster Te Wommels, over Geboorten, Huwelijken, Overlijden En Andere Gebeurtenissen*. 1710-1720. Verzameling Handschriften, afkomstig van de Provinciale Bibliotheek. 347. 1244. TRESOAR, 1.

⁷³ Spahr van der Hoek, *Geschiedenis Van De Friese Landbouw*, 1., 204.

⁷⁴ Elsa Lamy et al., "Factors Influencing Livestock Productivity," in *Environmental Stress and Amelioration in Livestock Production*, ed. V. Sejian, et al. (New York: Springer, 2012), 21.

⁷⁵ Timothy Newfield argues that weather conditions likely did not influence infection during a panzootic in the fourteenth century, but resulting famines (in the case of harsh winters or floods, for instance) would have spread the disease and influenced cattle nutritional status. Timothy Newfield, "A Cattle Panzootic in Early Fourteenth-Century Europe," *Agricultural History Review* 57, no. 2 (2010), 177. This argument also finds some support in “syndemic” theories disease and public health. Epidemics can feed off multiple environmental and social factors, including co-infection from multiple diseases, malnourishment, and stress. Merrill Singer, *Introduction to Syndemics: A Critical Systems Approach to Public and Community Health* (San Francisco: Wiley, 2009).

⁷⁶ Faber, *Drie Eeuwen Friesland: Economische En Sociale Ontwikkelingen Van 1500 Tot 1800*, 176.

conditions. The closeness and lack of movement also increased foul smells. “The stalls serve to collect the feed,” one poem bemoaned, “which after being eaten, is manure that lies rotting on the flood.”⁷⁷ The lack of movement on this smallest scale was also an important determinant of disease.

For the most part, institutional regulations were in keeping with contagionist models of disease, but provinces occasionally codified some of the miasma-oriented recommendations provided in pamphlets, books, or newspapers into law. The governors of Groningen (*Staten van Stad en Lande*), for instance, recommended adhering to the same remedies provided by the *Staten van Holland en West Friesland* and reprinted the medical suggestions in Groningen.⁷⁸ Contagion was not mutually exclusive from environmental theories of disease transmission. Often, regulations referenced both models. Instructions on the burial of dead cattle served on the one hand to prevent the spread of disease via dogs, but on the other prevented the further pollution of the environment.

Cattle plagues were well-documented events across Europe and the dense network of communication that connected the eighteenth-century Netherlands to the greater continent gave observers ample time to publish updates on its approach and prepare for its arrival. The resolutions of the *Staten van Stad en Lande* offer an illuminating look into the bureaucratic mechanisms of disease prevention and control of cattle movements in the Netherlands. They run from before the arrival of the first cattle plague until the last mention of disease in a 1723

⁷⁷ van Byler, *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. (Groningen: Jurjen Spandaw, 1719), 59.

⁷⁸ *Remedien Tegen De Contagieuse Siekte Onder De Paarden En Hoornbeesten* (Groningen: Gesina Elama, 1732).

proclamation that thanked God for ridding the province of the plague.⁷⁹ They highlight the significance of provincial attempts to combat the disease, especially via the management of disease movement. They also point to the particular manner in which provincial institutions understood animal disease, specifically the social and environmental contexts of contagion.

The first official recognition of cattle plague in Groningen occurred in December 1714.⁸⁰ At this point, the disease had reached pandemic proportions and having ravaged eastern and southern Europe travelled northwest toward the Low Countries. Reports filtered into Groningen in the waning days of 1713 that cattle plague had emerged in Holland and Overijssel and the *Staten* immediately took the necessary steps to avoid bringing the contagion inside provincial borders. This required managing all varieties of carriers, even those merely suspected of transmitting the disease. Groningen, therefore, posted numerous regulations that controlled cattle, cattle products, as well as other animals (and people) suspected of carrying the disease.

Their first act in 1713 was to forbid the import of all cattle into the province, as well as hides and hay from infected provinces.⁸¹ Groningen had likely received reports outlining possible means of transmission from neighboring provinces. One report noted that travelers from Holland introduced the disease to Friesland from their infected clothing. Beggars' dogs that had eaten diseased meat reportedly brought the disease to Gelderland in the south.⁸² As a result, the *Staten* placed restrictions on human movements and ordered unattended dogs killed and buried.⁸³

⁷⁹ *Plakaat (20 Feb) 1725*. Staten van Stad en Lande. 1. 477. Groninger Archieven.

⁸⁰ *Resolutie (15 Dec) 1714*. Staten van Stad en Lande. 1. 477. Groninger Archieven.

⁸¹ *Resolutie (21 Dec) 1713*. Staten van Stad en Lande. 1. 477. Groninger Archieven.

⁸² Since the Medieval Period, public health regulations discriminated against beggars and often attributed contagion to them. Annemarie Kinzelbach, "Infection, Contagion, and Public Health in Late Medieval and Early Modern German Imperial Towns," *Journal of the History of Medicine and Allied Sciences* 61, no. 3 (2006), 386.

⁸³ *Resolutie (4 Jan) 1714*.

Recognizing that imported cattle from Jutland and Denmark were other possible avenues of disease transmission, the *Staten* placed near complete restrictions on import and export of cattle later that year.⁸⁴

The *Staten* imposed each of these restrictions prior to the arrival of the disease in Groningen. The lack of disease in the province for the better part of two years possibly reflected the effectiveness of these measures, especially since Groningen was surrounded on all sides by infected areas. Naturally, the providential implications of this plague-free condition were not lost on Groningers. The *Staten* consistently referenced divine protection in their resolutions and acknowledged the prophylactic effects of prayer and other providential tools in conjunction with continued restrictions of the cattle trade.

Cattle Plague Responses: Spiritual Medicine

The moral/providential reading of the cattle plagues was far from static. The fields, markets, and cattle bodies that had symbolized God's grace and economic vitality inverted upon the introduction of plague in the Netherlands. Repentance, prayer, and fasting offered active strategies to combat disease. These treatments were retrospective, therapeutic, and preemptive and these moral salves competed in the marketplace of medical remedies. Providence also provided a potential pathway to a renewed and healed Netherlands. Religious and secular authorities alike encouraged their use to forestall the arrival of cattle plague, dampen and eradicate its influence, and prevent its reappearance.

⁸⁴ "Recept Voor De Ziekte Der Runderen," in *Nederlandsche Jaerboeken, Inhoudende Een Verhael Van De Merkwaardigste Geschiedenissen: Die Voorgevallen Zyn Binnen Den Omtrek Der Vereenigde Provintien, Sedert Het Begin Des Jaers Mdccxlvii* (Amsterdam: F. Houttuyn).

Moral and religious therapies have only recently been explored as important components of the popular medical milieu of early modern Europe. The spiritual dimension of medicine did not fit into the narrative of the modern scientific control of disease. Scholars have often argued that such “superstitious” beliefs were partly responsible for the delayed acceptance of new ideas and practices such as “stamping out” infected herds (known as the *Lancisi* system), inoculation, or the development of veterinary schools.⁸⁵ In the context of the broader European cattle plague pandemic that lasted from 1709 to the mid-1720s, scholars focus in particular in the *Lancisi* system because it was relatively successful at eradicating disease. Developed in 1714 by the Papal doctor Giovanni Lancisi during the epidemic in Rome, it called for the culling of all infected animals and the forced quarantine of all others. A version of this system successfully eradicated plague in England in six months.⁸⁶ The Lancisi system as well as other methods each had their own followers and antagonists in the Netherlands, though not necessarily continuously or by a wide section of the population. The dominant responses to cattle plague in the Netherlands were based in theology and human medicine.

Providential prescriptions for change went beyond interpretation and became active parts of the medical milieu. Moral prescriptions were both state supported and personally-oriented. In Catholic areas of Europe, livestock owners turned to pilgrimages, processions, and the

⁸⁵ These “advances” offer a spectrum of the newest developments in cattle plague response from the Lancisi system of culling infected herds system during the first cattle plague epidemic, to the rise of inoculation in the 1750s, to the rise of veterinary schools in the 1760s and 70s. See: Madeleine Ferrières, *Sacred Cow, Mad Cow: A History of Food Fears* (New York: Columbia University Press, 2006); C. Huygelen, “The Immunization of Cattle against Rinderpest in Eighteenth-Century Europe,” *Medical History* 41, no. 2 (1997): 182-96; J.F. Smithcors, *Evolution of the Veterinary Art: A Narrative Account to 1850* (Kansas City, MO: Veterinary Medicine Publishing Co., 1957).

⁸⁶ John Broad, “Cattle Plague in Eighteenth-Century England,” *The Agricultural history review* (1983): 104-15. Broad argues that the system may have been independently introduced by English doctor Thomas Bates.

miraculous curative power of the Saints for medical and spiritual therapies.⁸⁷ Many of these ritualistic remedies persisted in Catholic communities in Reformed areas of the Netherlands as well. In 1713, newspapers published reports of the miraculous healing powers of water of the fountain (*Runxputte*) near the town of Heiloo in North Holland. Rumors of the miracle quickly spread and farmers from “far and wide came thither with jugs and vats to get the holy water as a remedy for their sickened cattle.”⁸⁸ Protestant-dominated reportage noted the “incredibly large influx of foolish people in the early days [of the phenomenon], but the useless effects of the water speedily slowed it.”⁸⁹ Undoubtedly, the fountain’s attractiveness as a remedy also lessened because of the intense legal pressure exerted by the Reformed ministers in neighboring cities who punished Catholic pilgrims for making the journey.⁹⁰ In fact, much of the information on these Catholic responses came from Protestant sources and they reveal as much about ongoing religious conflict as they do spiritual response to cattle plague. Reformed minister Hendrik Carel van Byler, for instance, reported that in 1715 near Leiden, a Catholic farmer had hung an image of St. Anthony of Padua around his cow’s neck to prevent the spread of disease.⁹¹ He condemned this and other “superstitious” practices such as placing a cross on the forehead of affected cattle—a remedy he noted from previous epidemics. These reports and subsequent conflict highlighted the deep divisions between Catholic and Protestant interpretations of miracles and spiritual remedies.

⁸⁷ For analysis of the role of religious therapies such as pilgrimages and processions in Bavaria, see: Stühling, “Managing Epizootic Diseases in 18th Century Bavaria.”

⁸⁸ Ottie Thiers, *'T Putje Van Heiloo: Bedevaarten Naar O.L. Vrouw Ter Nood* (Verloren, 2005), 30.

⁸⁹ Ibid.

⁹⁰ P. Leendertz et al., *De Navorscher: Een Middel Tot Gedachtenwisseling En Letterkundig Verkeer Tuschen Allen, Die iets Weten, iets Te Vragen Hebben of iets Kunnen Oplossen* (1862), 294-295.

⁹¹ van Byler, *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. (Groningen: Jurjen Spandaw, 1719), 49.

Dutch communities considered prayer, penitence, and giving thanks to God efficacious means of averting or mitigating disaster, but the most common state-sponsored mechanism in the Netherlands was the Thanksgiving, Fasting, and Prayer day.⁹² Prayer days had a long history in the Netherlands and throughout Europe, but they peaked following the Dutch Revolt in 1568.⁹³ After receiving official sanction at the Synod of Dordrecht in 1618, a steady stream of official proclamations persisted through the eighteenth century, either as *vaste bededagen* (fixed days of prayer) or in reference to special events such as wars, nature-induced disasters, or political events.⁹⁴ Dictated by provincial governments or the *Staten Generaal* and performed at local churches, Dutch scholars interpret prayer days as methods of disaster prevention and insurance, as coping mechanisms following extreme events, or as civil rituals.⁹⁵

During episodes of plague, prayer days could be therapeutic or prophylactic, preventing the incursion of the disease into a protected area.⁹⁶ Provinces often declared prayer days at the first sighting of disease within its borders. December 15, 1714, for instance, was both the first official recognition of cattle plague in Groningen as well as the provincial declaration of an

⁹² A. Walsham, *Providence in Early Modern England* (Oxford University Press, 1999), 150.

⁹³ Kist, *Neêrland's Bededagen En Biddagsbrieven: Een Bijdrage Ter Opbouw Der Geschiedenis Van Staat En Kerk in Nederland. De Nederlandsche Biddagsbrieven*.

⁹⁴ See article 66 of the Church Ordinance of the Services approved at the Synod of Dordrecht. P. Biesterveld and H.H. Kuyper, *Kerkelijk Handboekje: Bevattende De Bepalingen Der Nederlandsche Synod En Andere Stukken Van Beteekenis Voor De Regeering Der Kerk* (Kampen: J.H. Bos, 1905).

⁹⁵ M.H.D. van Leeuwen and J. van Gerwen, *Zoeken Naar Zekerheid: Risico's, Preventie, Verzekeringen En Andere Zekerheidsregelingen in Nederland, 1500-2000* (Verbond van Verzekeraars, 2000), 393; Leo Noordegraaf, "Of Bidden Helpt? Bededagen Als Reactie Op Rampen in De Republiek," in *Of Bidden Helpt? Tegenslag En Cultuur in Europa Circa 1500-2000*, ed. Marijke Gijswijt-Hofstra and Florike Egmond (Amsterdam: Amsterdam University Press, 1997); Peter van Rooden, "Dissenters En Bededagen. Civil Religion Ten Tijde Van De Republiek," *BMGN: Low Countries Historical Review* 107, no. 4 (1992): 703-12.

⁹⁶ Noordegraaf, "Of Bidden Helpt? Bededagen Als Reactie Op Rampen in De Republiek," 38.

“extraordinary day of fasting and prayer” to be held on 9 January.⁹⁷ Declarations generally employed formulaic language and specified the reason for a prayer (in this case the “plague of infectious cattle disease that has befallen the province”), the date, and a penalty for failure to participate (25 guilders). The ubiquity of penalties for non-participation may be evidence that its effectiveness was not universally recognized. At the very least, it demonstrates that other cultural, social, and economic demands competed for congregations’ attention. Days of fasting and prayer excluded both leisure and work—a problematic requirement, particularly during times of disaster. Into the late eighteenth century, Dutch clergymen complained about the lack of attendance and interest in prayer days.⁹⁸

Religious organizations also encouraged individuals to practice private penance, though not to the exclusion of public prayer, fasting, and thanksgiving events. Jacob Harkenroht offered a four-step plan that focused on individual actions in response to cattle plague. First, Harkenroht encouraged investigating causation of the cattle plague; second, to confess one’s sins; third, self-improvement and conversion; and lastly, he suggested personal prayers for the country as a whole.⁹⁹ Harkenroht assured the reader that this panacea would not only cleanse the region of cattle plague, but also every other disaster leading to a reinvigoration of the countryside.¹⁰⁰ This, he noted, was in contrast to another option frequently chosen by afflicted farmers: profane medicine.

⁹⁷ *Plakkat* (15 Dec) 1714. Staten van Stad en Lande. 1. 477. Groninger Archieven.

⁹⁸ Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)*, 201.

⁹⁹ Harkenroht, *Kerkreede over Oostfrieslands Rundvees Pest, Gevreest, En Helaas Gekoomen, Aangetoont Uit Jes: Vii. Vs. 21. ... Op Een Maandelijke Bededag Aan De Gemeente Te Larrelt in Oostfriesland* (Embden: Enoch Brantgum, 1716), 38-41.

¹⁰⁰ *Ibid.*, 40-41.

Cattle Plague Responses: Profane Medicine

“No human help or skill,” Harkenroht argued, “much less any superstitious or idolatrous measures, can cure this cattle sickness.”¹⁰¹ Prayer was the sole means of salvation according to this view. This exclusive providentialism was pessimistic, but uncommon during this first episode of cattle plague. Few providential sources excluded secular remedies during the first outbreak of cattle plague. In many parts of the Europe including the Netherlands, people attempted to control or cure disease using profane techniques or medicines. Tradespeople involved in the production of animal products typically engaged in healing practices we now associate with these professions. In parts of Germany, for instance, tanners and skimmers provided medical advice on animals.¹⁰² There is less evidence of this practice in Dutch sources. In fact, first-person accounts of farmers’ medical choices for cattle are rare, especially from this first episode of cattle plague. Extant indications hint at the perceived uses of profane medicine and its popularity, but little evidence indicates whom exactly was responsible for administering treatment. This was possibly due to the advanced state of “medicalization” or professionalization of the healing arts in the Netherlands; it may also be due to different social expectations of tradespeople as compared to other regions of Europe; it could be due to the art’s folk status or grounding in oral tradition; or it may simply indicate the need for further historical investigation.

Premodern animal medicine worked within its own set of assumptions about efficacy and the usefulness of cures. Practitioners oriented medicine to the production of desired results such

¹⁰¹ Ibid., 41.

¹⁰² Jutta Nowosadtko, “Milzbrand, Tollwut, Wölfe, Spatzen Und Maikäfer. Die Gesellschaftliche Verteilung Von Zuständigkeiten Bei Der Bekämpfung Von Viehseuchen Und Schädlichen Tieren In Der Frühen Neuzeit,” in *Beten, Impfen, Sammeln: Zur Viehseuchen- Und Schädlingsbekämpfung In Der Frühen Neuzeit*, ed. Dominik Hünninger Katharina Engelken, Steffi Windelen (Göttingen: Universitätsverlag Göttingen, 2007), 80.

as purging or vomiting. These actions attempted to restore the body's humoral equilibrium and were in keeping with Galenic models of health, disease, and therapy with roots in antiquity. Galenic humoralism and perhaps Paracelsian approaches to treatment offered an extensive array of options. These models informed remedies as well as public health regulations.

The close connection between human and animal medicine is evident in nearly every aspect of their treatment, from the particular ingredients of the “cures” and “preservatives” to the public emphasis on managing animal movement. The bewildering arrays of ingredients in these concoctions were by-and-large remedies in keeping with Galenic humoralism and neo-Hippocratic environmental medicine. These medical traditions were dominant into the eighteenth century. According to the Galenic view, health and sickness were a continuum and always in tenuous balance. Too much or too little of one of the four humors prompted sickness.¹⁰³ Many early modern treatments, as a result, attempted to restore the body's balance. Medical practitioners commonly prescribed bloodletting, purgatives, and close monitoring of diet as prophylaxes and therapies for cattle, just as they did for humans.

Many of these cures had medical roots in antiquity and variations of particular methods or recipes are found in a variety of European contexts.¹⁰⁴ The Duke of Bavaria promoted a remedy that combined “theriaca (a quarter ounce) in a pint of good wine and [then] scraping the mucous membranes with a spoon and rinsing them with garlic and pepper crushed in vinegar.”¹⁰⁵ In his *General Chronological History of the Air, Weather, Seasons, Meteors*, Thomas Short

¹⁰³ Lindemann, *Medicine and Society in Early Modern Europe*, 9-10.

¹⁰⁴ For a list of “desperate remedies” in national context, see: Spinage, *Cattle Plague: A History*, 333-372.

¹⁰⁵ Jean Blancou, *History of the Surveillance and Control of Transmissible Animal Diseases* (Office international des épizooties, 2003), 176.

reported on a cure developed in Holland in 1713. It suggested taking “Paul’s Betony, Lungwort, Hyssop, Scordium, of each four handfuls; Roots of round Birthwort, Gentian, Angelica, Butterbur, Tormentil, Caline-Thistle, Juniper and Bayberries, of each twelve Ounces; mix, and make a powder; Dose one Ounce every morning with a Horn in warm Beer.”¹⁰⁶ Many recipes also suggested bleeding the animals. One anonymous pamphlet from 1714, for instance, advised administering a warm medicine during the day and if the cow had not recovered by the morning of the second day, to let three pounds of blood.¹⁰⁷ Each of the treatments worked to restore humoral equilibrium to animal bodies.

The neo-Hippocratic emphasis on environments was also important to early modern diagnoses. Indeed, interlinking Galenic and neo-Hippocratic influences often grounded medical interpretations of disease, such as when polluted environment destabilized the bodies’ humors.¹⁰⁸ This was just as true for cattle as it was for humans. Neo-Hippocratic practitioners thought environments could be just as *besmettelijk* (infectious) to cattle as they were to each other. Pastures and stalls could each infect cattle.¹⁰⁹ They considered damp, miasmatic environments particularly dangerous and their medical literature emphasized the importance of clean and dry cattle surroundings. Draining pastureland was one possibility, but more frequently,

¹⁰⁶ Thomas Short, *A General Chronological History of the Air, Weather, Seasons, Meteors, &c. In Sundry Places and Different Times: More Particularly for the Space of 250 Years : Together with Some of Their Most Remarkable Effects on Animal (Especially Human) Bodies and Vegetables* (London: T. Longman and A. Millar, 1749), 5.

¹⁰⁷ anon., *Bedenkingen, En Raad, Noopende De Tegenwoordige Stervte Onder Het Rundvee*, 's Gravenhage, 14-15.

¹⁰⁸ Kinzelbach, "Infection, Contagion, and Public Health in Late Medieval and Early Modern German Imperial Towns."

¹⁰⁹ *Plakaat* (6 Mar) 1714. Archief van de Burgemeesters. 5022. 10. Stadsarchief Amsterdam.

contemporaries focused on cleaning and aerating cattle stalls. Many publications suggested burning gunpowder inside the stalls as an additional means of drying the air.¹¹⁰

As prominent as these medical traditions were, they had no monopoly on explanations for disease or cures. In addition to (or in coordination with) providential treatments, authors drew on other medical traditions, including possibly Paracelsianism. No shortage of recipes, for instance, required the Paracelsian elements of salt, sulfur, and mercury, though the emphasis on astrology was notoriously weak in the Netherlands.¹¹¹ Paracelsus' assertion outside agents caused disease rather than humoral imbalances may have also blended well with developing notions of contagion, cleanliness, and quarantine.

One of the more innovative and popular treatments throughout Europe involved scraping the insides of the mouths of cattle with a silver fork or spoon until they bled. While its provenance is inexact, the technique may have been employed as early as the 1680s.¹¹² Many Dutch accounts advocated the use of a large hoe-like instrument made of "pure silver" and mounted on a foot long wood or iron pole. Medical practitioners used this instrument to scrape

¹¹⁰ This preventative makes an appearance in many Dutch publications as well as John Mills, *A Treatise on Cattle: Shewing the Most Approved Methods of Breeding, Rearing, and Fitting for Use, Horses, Asses, Mules, Horned Cattle, Sheep, Goats, and Swine ; with Directions for the Proper Treatment of Them in Their Several Disorders ; to Which Is Added, a Dissertation on Their Contagious Diseases* (Dublin: W. Whitestone, 1776), 454: "In fact, nothing is fitter to correct the bad qualities of a putrid air, than that excellent antiseptic, the sulphurous and nitrous acid set at liberty by the deflagration of gun-powder."

¹¹¹ This trend had already begun in the early seventeenth century. See: Hans de Waardt, "Breaking the Boundaries: Irregular Healers in Eighteenth-Century Holland" in *Illness and Healing Alternatives in Western Europe* (London: Routledge, 1997).

¹¹² The provenance of the silver instrument comes from: Spinage, *Cattle Plague: A History*, 348. Dorwart traces the technique to France in the 1730s. Dorwart, "Cattle Disease (Rinderpest?): Prevention and Cure in Brandenburg, 1665-1732," 84; Anon. *Remedien Tegen De Contagieuse Siekte Onder De Paarden En Hoornbeesten* (Eds. Paulus and Isaac Scheltus) 1732. Stads- en Gemeentebestuur van Beverwijk. 3769. 266. Noord Hollands Archief, 6. This treatment was also referenced in Hermann Friedrich van Beesten's "Historische Anmerkung Bentheimscher Geschichte under Regierung Friederichen dieses nahmens des Erstens graffen zu Bentheim oder zeitdther 1731 bis...vorgefallen," as transcribed in "W.H. Dingeldein, "Iets over Mond En Klauwzeer in 1732 En Vroeger," *Tijdschrift voor diergeneeskunde* 36(1933), 389-390.

the blisters and pustules on the tongue to release the vile effluvia. Like many of these treatments, the use of silver here is an enticing, albeit puzzling, historical problem of attribution. Silver was a popular remedy from antiquity to the early modern period, but it was also a crucial element in the medical and hermitical beliefs of Paracelsus. The difficulty in determining the origins of these popular remedies is an indication of the interconnectedness of these models of health and disease. Interestingly, many of these treatments are evident in regions across Europe, indicating a vibrant international market in remedies. Little scholarship has investigated this phenomenon, though records from Italy, France, several German states, and the Netherlands all draw on similar concoctions and notable key ingredients such as theriac, pepper, juniper, and vinegar.¹¹³

The Eighteenth-Century Disaster Period

Cattle plague was devastating, but it was not the only disaster of this early part of the period of disaster. A massive coastal flood struck the province of Groningen in 1686, killing almost 1,600 inhabitants “bringing many thousands of people into misery.”¹¹⁴ In 1702, another widespread coastal flood hit the Netherlands, this time inundating large parts of North Holland and the area south and east of Amsterdam. This was the same region intentionally flooded during the *rampjaar* to prevent French advance and the high cost of dike repair in conjunction with the declining value of land prices since the disasters of the 1670s prevented inhabitants from

¹¹³ Stühling, “Managing Epizootic Diseases in 18th Century Bavaria,” 476.

¹¹⁴ H. Schenckel, L. Smids, and T. Brongersma, *Kort En Bondige Beschrijvinge Van De Schrickelijcke Water-Vloedt Den 13. Novemb. 1686. Over De Provincie Van Stadt En Lande Ontstaen, Behelsende Een Waerachtigh Verhael Van ... Voorvallen ... Alles Door Eygene Ondervindinge Ofte ... Oor- En Oogh-Getuygen Bevestight* (Groningen: by Carel Pieman, 1687), preface. This contemporary pamphlet estimated that 1476 people and almost 7000 cattle died, though later estimates placed it closer to 1600. Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 137.

maintaining the dikes properly.¹¹⁵ The winter of 1708/1709 was the coldest in the previous 500 years.¹¹⁶ One anonymous pamphlet during this winter described how “many people froze to death, men, women and children.” The cold was so severe, it stated, “postal riders died frozen on their horses.”¹¹⁷ In addition to limiting hay production, this winter prompted one of the most severe and European famines since the Medieval Era, and contemporaries in the Netherlands noted the severely increasing price of staple foods.¹¹⁸

Cattle plague arrived in the wake of these and many other disasters. It also lasted for seven years in the Netherlands and in the meantime, inhabitants had to cope with concurrent disasters, for instance the severe coastal floods of 1714 and 1717. The many natural disasters of the era, particularly those that affected the agricultural sector, contributed to the Dutch Republic’s dire economic straits. Dike rebuilding costs and the reduced income due to repeated inundation, frosts, pests, and finally cattle plagues amplified these burdens in every province.¹¹⁹ These costs were then passed on to urban populations.

Provincial resolutions and legal documents revealed an agrarian population under pressure to obey necessary restrictions on cattle movement, and the increased economic necessity of continuing in these necessities in the context of multiple disasters. Whiggish

¹¹⁵ Alfons Fransen, *Dijk Onder Spanning : De Ecologische, Politieke En Financiële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864* (Hilversum: Verloren, 2011), 184-188.

¹¹⁶ Jürg Luterbacher et al., "European Seasonal and Annual Temperature Variability, Trends, and Extremes since 1500," *Science* 303, no. 5663 (2004): 1499-503.

¹¹⁷ Anon. *Opregt Dog Droevig Verhael, Van De Groote Elende En Droefheyd, Veroorzaekt Door De Felle Kou En Sterk Vriesend Weer Van Deeze Winter*. 1709. Universiteit van Amsterdam Bijzondere Collecties.

¹¹⁸ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750.*, 363-365. Simon Jacobsz Kraamer noted in his journal, for instance, noted the increasing price of bread. Simon Jacobsz. (?) Kraamer. *Eenijge Merckwaerdige Gebeurttenisse, Voorgevalle Bij Mijn Tijdt*. c. 1752. Doopsgezinde Gemeente Zaandam-West. KA 0012. 39.IV. Gemeentearchief Zaanstad.

¹¹⁹ H.K. Roessingh, "Landbouw in De Noordelijke Nederlanden, 1650-1815," *Algemene Geschiedenis der Nederlanden* 8(1979), 19.

historical scholarship tends to blame decentralized Dutch governance for its inability to enforce quarantines and import restrictions. They likewise condemn the Dutch farmers and merchants who circumvented these restrictions. From a contemporary perspective, it is immediately clear that provincial governments actively instituted and enforced restrictions, but that the weight of the combined disasters of the eighteenth century virtually forced many Dutchmen to evade them.

Some Dutch adversely affected by the plague attempted to circumvent these restrictions despite the danger it potentially posed to humans. In Friesland, Jan Wopkes noted in his journal in December of 1714 that thousands of recently dead cattle were slaughtered and their “flesh cooked for tallow... [and also were] salted and eaten by many people.”¹²⁰ This was in direct opposition to the provincial decree from December of the previous year that ordered the burial of diseased corpses.¹²¹ Groninger authorities sometimes brought penalties against merchants, farmers, and butchers for illegal transport, false certification, and slaughtering of cattle.¹²² In October of 1715, for instance, Harm Faasterman and Claas Goutier were brought before the *Neder-gericht* of Groningen after being accused of “importing infected cattle meat.”¹²³ The many proclamations (*plakaaten*) printed and distributed by the province clearly lay out these penalties, but the repetition of their regulations every few weeks is further indication that they were not

¹²⁰ Spahr van der Hoek, *Geschiedenis Van De Friese Landbouw*, 218.

¹²¹ Resolutie (21 Dec) 1713. 1.477. Groninger Archieven.

¹²² See: *Joahannes Haekenbergh Wegens Het Vervalsen Van Verklaringen over De Gezondheid Van Vee*. 1731. Volle Gerecht van de stad Groningen, 1475 - 1811. Groninger Archieven. 1534.1758. Also, inventory numbers: 2074, 2613, 1447, 1465, 2581, 2338.

¹²³ *Harm Faasterman En Claas Goutier Wegens De Invoer Van Bedorven Rundvless*. 1715. Volle Gerecht van de stad Groningen, 1475-1811. 1534. 1447. Groninger Archieven. The “Neder-gericht” was a lower court of the Groningen composed of one of the burgemeesters and three other judges. It dealt with the smaller civil trials. In the case of criminal trials, the Neder-gerecht offered instruction, but the higher court (*Volle Gerecht*) sentenced. Robert Fruin, ed. *Geschiedenis Der Staatsinstellingen in Nederland Tot Den Val Der Republiek* ('s Gravenhage: M. Nijhoff, 1901), 133.

always followed. Regardless of the burden these restrictions placed on merchants, some early proclamations actively disparaged wrongdoers. One proclamation from May 28, 1714 condemned the “profit-seeking men” who avoided a ban on importing calves from Friesland.¹²⁴ Others tried working around restrictions, which forced the provinces to quickly adapt their regulations. The *burgermeesters* and the court of Groningen, for example, declared a ban on smoked beef only after being “informed from all sides that a very large amount of smoked beef was brought into the city...[by]...selfish men who want to make some foul profit from these animals that only recently died from the evil cattle sickness that has been spreading in all directions.”¹²⁵

The Staten van Stad en Lande in Groningen sometimes acknowledged that this lawlessness might not originate in selfishness or greed. The depressed condition of the countryside prompted continual efforts to alleviate the toll of multiple disasters. The provinces repeatedly withdrew and reinstituted restrictions on import and export of cattle, for instance, based on perceived risk of infection vs. economic necessity.¹²⁶ Seemingly unrelated disasters also prompted this back-and-forth. The Christmas Flood of 1717, for example, placed Groningen in the awkward position of reiterating their restriction on cattle importation, despite the destruction of the majority of the healthy herds in the flood. Two months later, after recognizing the impossibility of the situation, Groningen not only forbade the export of cattle, but also

¹²⁴ *Resolutie (28 May, 1714)*. 1714. Staten van Stad en Lande. Groninger Archieven. 1.477.

¹²⁵ *Plakaat (31 Jan) 1715*. Volle Gerecht van de stad Groningen, 1475 - 1811. 1534. 1465. Groninger Archieven.

¹²⁶ The adaptability of legislation is in keeping with recent scholarship that stresses the contested nature of early modern governance. See: Dominik Hünig, "Cattle Plague in Early Modern Germany: Environment and Economy / Knowledge and Power in a Time of Crisis," in *Elements - Continents. Approaches to Determinants of Environmental History and Their Reifications*, eds. Bernd Herrmann and Christine Dahlke (Stuttgart: Nova Acta Leopoldina, 2009), 238.

allowed importation to help restore their depleted herds despite the continued threat of plague. In this manner, the weight of combined disasters resulted in policy changes that would ordinarily have been unnecessary.

Providential documents causally linked these disasters together as divine punishment and referenced larger themes of inversion and decline. Repeated disaster underscored God's wrath and many sources framed plague in the context of lost prosperity. One pamphlet that discussed the floods of 1714 and the cattle plague together, questioned why God "who did everything before for the wellbeing of his people, now gives us no peace." The cattle now die "in the fields as well as the stalls," he stated, and those "cattle that had until then survived the plague, they [farmers] saw miserably drift in the flood waters."¹²⁷ These conditions portended of future troubles as well, and the pamphlet continued with a prayer—a prophylactic for disasters in general.

"O God of Gods, look at this people kneeling before your throne, and graciously free them from new wars, pestilence, and loss of commerce; tame the winds, silence the cattle plague, confirm those that through you gave us peace, and make my grass-rich land again full of cows, and oxen, so that the milk and honey may again flow, repair the commerce upon which I depend, hasten the peace between me and the constable; give abundance of grain, and oil for my wounds; for already I'm warned of troublesome neighbors, and give us health, fat, fruitfulness, pious years, that I can again see the smoke from the Netherlands' altar of thanks."

Decline was already present, and though hopeful, nothing in this prayer reveals a sense of confidence. Indeed, in a similar pamphlet that voiced the fictional dialogue between two

¹²⁷ Jan van Gyzen, *Jan Van Gyzen's Klaagend Nederland, Bezogt Met Sterfte Onder Het Rundvee, En Swaare Storm Winden, Voorgevallen 26 En 27 Febr. En 6 En 7 Maart 1714* (Amsterdam: Jacobus van Egmont, 1714).

herder named Alkon and Damon, the former warns of what this cattle plague might mean in the longer term. “I’m afraid, neighbor Damon,” he stated, “that these unfortunate circumstances only foretell of future disasters, even more severe.”¹²⁸

Conclusion

The cattle plague outbreak of 1713 signaled the continuation of troubles that had been ongoing since 1672. Cattle plague was devastating, partly because it compounded the difficulties of decades of war, economic troubles, and nature-induced disaster. It was also a particularly virulent disease with high mortality. Cattle were a powerful symbol of Golden Age fertility and economic prosperity as demonstrated in textual and material evidence. Disease inverted these associations as dead cattle came to symbolize the Dutch fall from grace and diseased landscapes replaced Arcadian environments. These associations directly influenced Dutch interpretation and response to cattle plague, particularly from the providentialist perspective. Religious interpretations of sin/punishment causation as well as historically resilient folk and learned medical notions influenced public policy and individual actions and offered a panoply of opportunities to cope with the disease. Providential and medicinal therapies highlight the close connection between human and animal diseases as well as the interdependency of secular and spiritual responses.

Significantly, governmental, religious, and personal documents attest to the perceived connectedness of these disasters with other eighteenth century disasters that preceded and continued during the cattle plague epidemics. Public records indicate that the combined toll of

¹²⁸ Gerardus Outhof, *Damon. Ofte Herdersklagte over De Sterfte Onder't Rundvee [...] Waar Mede Godt Oostvrieslandt [...] Bezoekt* (Emden: [pr.] wed. E. Tremel [and] H. van Senden, [for] E. Brantgum, 1716), 23.

multiple disasters forced the Dutch to continually reassess their position regarding the necessities of disease control and economic and social stability, particularly as they related to disease movements. Providential documents also linked disasters together, both to reinforce the causal argument of divine punishment and to warn of future disasters if the Dutch should fail to improve their declining moral condition.

Chapter 3. “The Fattened Land Turned to Salted Ground”: The Christmas Flood of 1717 in Groningen

Thomas van Seeratt’s first flood emergency after being installed as director of public works (*commies provinciaal*) in Groningen occurred only three months after his appointment in the fall of 1716. Following a powerful storm that hit the coast on the fifth and sixth of December in 1716, a coastal dike had broken in the northeast corner of the province near the town of Delfzijl. Unfortunately, the *commies provincial* responsible for this region was absent, so the province sent his counterpart, Van Seeratt, to assess the impact and make necessary repairs. The damage was serious and water streamed through at least four breaches in the dike. At four *roeden* (14 meters) wide, one gap was large enough that even at low tide, the flood water stood at almost three meters.¹ Despite his inexperience, Van Seeratt quickly took charge and reported back to the provincial deputies (*Gedeputeerde Staten van Stadt en Lande*) about those dikes that required emergency repairs. He also added a report on the decrepit status of sea dikes throughout the remainder of the province. “With much respect,” he began, “the eastern dikes as well as those of the entire province...are, in general, in a very terrible and miserable state.” The earthen bodies of the dikes, he argued, were too steep and the wooden palisades that protected the seaward side of the coastal dikes were “too low and insufficient” to protect against the erosive force of the waves. Furthermore, the land immediately behind the dikes was “unnecessarily dug out and

¹ Thomas van Seeratt. *Journal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721*. 1730. Staten van Stad en Land. 1. 818. Groninger Archieven, 4. All measurements were converted to meters using the Meerten’s Institute’s database of “Old Measurements and Weights.” See: <http://www.meertens.knaw.nl/mgw/>

spoiled so that there was as much a sea inside as outside the dike.”² The flood, in his estimation was a managerial and technological failure. The province was initially unconvinced and countered his assessment by arguing that the dikes were in a much better state than previously. They did, however, send Van Seeratt to the neighboring province of Friesland in early 1717 to assess the state of their dikes, perhaps with an eye to improving their own. These efforts came too late. The vulnerability of Groninger dikes, already apparent in 1716, was made inescapably clear on Christmas Eve night, 1717.

The weather on the night of December 24, 1717 gave Groningers little reason to worry. It had been mild and reasonably stormy month across Western Europe and a “strong and persistent southwest wind” had been blowing across the region for days.³ Residents understood that although winter was the most dangerous time for storm surges, they rarely occurred when the wind pushed the waters away from shore. When Groninger families went to sleep on Christmas Eve, few must have expected the extent and severity of the disaster that would utterly engulf this region within the next few hours. Despite the placid evening, at least a few inhabitants noted their apprehension. An account from a church book in the town of Leens noted that the previous few days had experienced worsening weather, including “thunder, lightning, and hail.”⁴ Thomas van Seeratt also noted unease in his journal. During his inspection of the

² Ibid., 7-8.

³ Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 439; Gerhardus Outhof, *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden, in Meest Alle Plaatsen Van Europa, Van Noachs Tydt Af, Tot Op Den Tegenwoordigen Tydt Toe: Met Een Nieuw Kaertje Van't Verdrongen Landt in Den Dollaart, Afbeeldinge Van Kosmas En Damianus En Van Den Steenenman in Vrieslandt: Met Eene Breede Beschryvinge Van Den Zwaaren Kersvloedt Van 1717, En Bygevoegde Tafels Der Watervloeden* (Embsen: H. van Senden, 1720), 645.

⁴ “Iets over Den Kersvloet Van 1717,” in *Groninger Volksalmanak Voor Het Schrikkeljaar 1848* (Groningen: A. Oomkens, J. Zoon, 1848), 143.

dikes that evening, he noticed the exceptionally low tide. It was so low, he stated, that “an old man of eighty years who had always lived there said that he had never seen the water so low.” The sky was equally ominous. It reminded him of weather experienced as a sea captain in the West Indies. The air had “accumulated” and gotten “heavier like an incoming hurricane” in much the same way it did on the other side of the world.⁵ By 10 o’clock in the evening, the wind veered its direction and began blowing strongly north/northwest creating the ideal conditions for a storm surge.

Eyewitness accounts of the storm and its flood vary, but all agree that the initial moments were terrifying. The sound of the water rushing through the dike breaches was likened to an animal roar. The incoming water crashed into houses, burying them and their sleeping inhabitants in an instant beneath the icy winter waters. The East Frisian minister Gerhardus Outhof despaired that “thousands of people of every age, men and women, drown[ed] in the salty seawater, many of whom were overtaken in their beds by the rushing waters.”⁶ The nearer a village was to a broken dike, the faster and more deadly this first onslaught became. “The storm came charging over the land,” one witness recounted.⁷ One report of this flood event, called the “Sincere and precise historic-account of the marvel-worthy, miserable, frightful, and very destructive flood” related these first moments:

⁵ van Seeratt, "Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721," 15.

⁶ Gerhardus Outhof, *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden, in Meest Alle Plaatsen Van Europa, Van Noachs Tydt Af, Tot Op Den Tegenwoordigen Tydt Toe: Met Een Nieuw Kaertje Van't Verdrongen Landt in Den Dollaart, Afbeeldinge Van Kosmas En Damianus En Van Den Steenenman in Vrieslandt: Met Eene Breede Beschryvinge Van Den Zwaaren Kersvloedt Van 1717, En Bygevoegde Tafels Der Watervloeden* (Emden: van Senden, 1720), 656.

⁷ Jan Stoffer van Weerden, "De Kerstvloed Van 1717," in *Marne Memories* (Leens: Vereniging Kring de Marne, 2000), 108.

“How terrible, the water’s power that pierced the dike and brought itself unto the land;
 How the unmastered sea swelled and rushed through the holes in the dikes;
 How indescribable, the fury of the waves, the land buried further and further;
 The pounding waves break the houses and of those, most are ground to dust;
 How many people sought to flee this dangerous and deadly invader;
 On top of houses, roofs, beams, and trees, all stranded by salty streams;
 This, children, servants, men, and women were all forced to watch...”⁸

For those not immediately drowned, the following hours and days tested the limits of their endurance. Survivors’ accounts related both personal tragedy and providential survival on the night of the storm. A man from the coastal town of Vierhuizen lost his wife, five children, and sister-in-law to the flood and drifted on a piece of his house to the nearby town of Ulrum.⁹ Willems van Pieterburen managed to save his wife, six children, and his fourteen day old infant by strapping them to a hay bale, only to see those efforts cruelly negated when his children drowned as the night wore on.¹⁰ He and his wife were finally saved, half dead, at noon the next day. By Christmas morning, the city of Groningen (*Stad Groningen*), under the direction of Thomas van Seeratt, mobilized and dispatched rescue teams. Rescuers commandeered every

⁸ A.E. Crous, *Opregt En Nauwkeurig Historis-Verhaal Van De Verwonderenswaardige, Droevige, Schrikkelike En Seer Schadelike Waaters-Vloed, Voorgevallen in De Provincie Van Groningen En Ommelanden, Op Kersdag Den 25. December Ao. 1717: Daarom Met Regt Genaamt De Kers-Vloed of Midwinters-Vloed. : Met Al 'T Geene in Deselve, Aanmerkelijk Is Voorgevallen ... : Beneevens Een Byvoegsel Van 'T Aangrensend Oost-Vriesland, En De Daar Bygeleegene* (Seerp Bandsma, 1719), 1.

⁹ J. Bakker, *Stormvloeden!: Uit Oude Kronieken Bijeenvergaard En Breedvoerig Omschreven, Vanaf 1625 Tot En Met Januari 1916, Welke in 'T Bijzonder Ons Land Hebben Geteisterd, Alsmede Beschrijving Omtrent Het Ontstaan Van "De Dollard", Met Een Kaart Van Het Verdrongen "Reiderland"* (Bakker/Scheemda, 1925). Bibliotheek GAG Boeken, nr 1-500, Depot B, Kast 096, Element 1, 12. Story taken from Gerhardus Outhof's *Verhaal*.

¹⁰ Ibid.

available ship, including barges and ships normally reserved for peat transportation.¹¹ The city itself experienced comparatively little flooding, but the hinterlands of Groningen (called the *Ommelanden*) were buried by 7 to 10 feet of water.¹² With the exception of church steeples and the occasional tree or tall building, the landscape bled into the adjacent North Sea. By midday, over thirty ships returned to Groningen with rescued people and livestock.¹³ The city offered shelter, provided food, and took up collections to help the disaster victims. Survivors brought into the city quickly filled the squares, churches, and government buildings.¹⁴ To onlookers, this partially drowned city swamped in refugees must have seemed particularly perverse considering this day's typical association with festivity. In neighboring East Friesland, the minister Johann Christian Hekelius noted that "in place of celebrating the happy event of the birth of Jesus Christ, there was nothing to be heard aside from screaming, lamenting, and crying."¹⁵

The Christmas Flood of 1717 was one of the largest disasters in early modern history.¹⁶ Flood waters inundated fields and cities as storm surges burst through dikes stretching from England to Denmark. Coastal Germany was hardest hit, but the Netherlands was also severely affected, especially the northeastern-most province of Groningen.¹⁷ The entire southern coast of

¹¹ David Hartsema, "De Kerstvloed Van 1717," in *Vroeger En Later* (Bedum: Profiel, 1989). David Hartsema, "De Kerstvloed van 1717," *Vroeger en Later*, (Bedum: Profiel, 1989), 31.

¹² I.H. Zijlma. *De Kerstvloed Van 1717 in De Marne*. Bibliotheek RAG (Losse Boeken). 350. 1760. Groninger Archieven, 2.

¹³ van Seeratt, "Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721," 20.

¹⁴ Zijlma, "De Kerstvloed Van 1717 in De Marne."

¹⁵ Fokko Bosker, *Zeedijken: Mythes e Feiten over 2000 Jaar Kustbescherming* (Friese Pers/Noordboek, 2008), 69. Excerpt from the diary of Johann Christian Hekelius.

¹⁶ A shortened, edited version of this chapter appears in Adam Sundberg, "Claiming the Past: History, Memory, and Innovation Following the Christmas Flood of 1717," *Environmental History* April, no. (forthcoming) (2015).

¹⁷ Most contemporary accounts of the Christmas Flood focus on the German areas, though there are several Dutch sources that highlight the floods effects in the Netherlands. This paper uses Groninger source material, but for a

the North Sea coped with widespread destruction, economic uncertainty, and massive social dislocation in the following months and years.¹⁸ (Figure 3.1) Provincial administrators recorded the type and location of dike breakages and the height and extent of flood damage and sometimes published them in chronicles and pamphlets. In the case of providentialist literature, publishers in Amsterdam, Groningen, and a Dutch-language press in the nearby German city of Emden republished the figures in pamphlets in chronicles. Clergymen tabulated the number of victims and destruction of property and recorded them in their parish logs. This accounting served the dual purposes of managing the aftermath of the disaster and recording the event for posterity. Recent scholarship suggests as many as 13,700 people died in the flood, of which almost 2,300 were in Groningen.¹⁹ Coastal flooding is not a rare occurrence in Dutch history, but the scope and severity of the disaster easily place this event in the top tier of North Sea flood disasters since 1500.²⁰

treatment of Holland and especially Friesland, see: C.J., *Korte Beschryvinge Van De Schrikkelijke Watervloed, Veroorsaekt Door Een Sterke Stormvint/Voorgevallen Tusschen Den 24. En 25. December 1717: Soo in Holland/Friesland/Groninger-Embder En Oost-Friesland* (Leeuwarden: by Johannes Thijssens, 1718). For a short, more regional account, see: anon., *Omstandig Verhaal Van De Schrikkelijke En Nooid Gehoorde Watervloed, Voorgevallen in Engeland, Zeeland, Holland, Frisland, Groeningen En Duytsland, &C. Op Den 25 December 1717* (Middelburg: Johannes op Somer, 1718).

¹⁸ The most complete accounts of the effects on German lands are in: Manfred Jakubowski-Tiessen, *Sturmflut 1717: Die Bewältigung Einer Naturkatastrophe in Der Frühen Neuzeit* (Oldenbourg: Oldenbourg Wissenschaftsverlag, 1992). "'Harte Exempel Göttlicher Strafgerichte". Kirche Und Religion in Katastrophenzeiten: Die Weihnachtsflut Von 1717," *Niedersächsisches Jahrbuch für Landesgeschichte* 73(2001): 119-32.

¹⁹ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 451-453.

²⁰ Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 451; Lamb and Frydendahl rank this disaster as the 11th most destructive from 1500 to the present. H. H. Lamb and Knud Frydendahl, *Historic Storms of the North Sea, British Isles and Northwest Europe* (New York: Cambridge University Press, 1991), 9.



Figure 3.1 The red outlined areas are the regions most heavily affected in the Netherlands. The shaded areas indicate the extent of the inundation. From: Johann Baptiste Homann, “Geographical Vision of the Terrible Water Flood in Niederdeutschland” *Geographische Vorstellung der jämmerlichen WASSER-FLUTT in NIEDERTEUTSCHLAND, welche den 25.Dec. Ao. 1717, in der heiligen Christ-Nacht, mit unzähllichen Schaden und Verlust vieler tausend Menschen einen großen theil derer Hertzogth. HOLSTEIN und BREMEN, die Grafsch. OLDENBURG, FRISLANDT, GRÖNINGEN und NORT-HOLLAND überschwemmet hat., 1718.*²¹

²¹ This type of large-scale, detailed disaster mapping was incredibly rare. For an evaluation of this map, see Dietrich Hagen, *Die Jämmerliche Flut Von 1717: Untersuchungen Zu Einer Karte Des Frühen 18. Jahrhunderts* (Oldenburg: KomRegis, 2005). Hagen identifies several visual and allegorical clues that he interprets as derivative of early enlightenment thinking.

Documentation of the Christmas Flood also revealed Groningen's potential for innovation and change. Water management reports showed entire sections of coastal dikes washed away or needing repair. Provincial documents highlighted the need for significant financial and administrative changes to fund and manage these dike repairs. Religious literature indicated that even the ultimate meaning of the disaster required revisiting. Groningen's post-disaster littoral landscape was seemingly ripe for interpretation and intervention, both technologically and theologically.

Notwithstanding the windfall possibilities available, however, few Groningers offered rhetoric of drastic change to the moral, political, or physical landscape. The Christmas Flood instead showcased the contested nature of disaster interpretation and adaptive decision making in the wake of such events. It sparked a period of retrospection, condemnation, and negotiation between parties seeking to frame the disaster to further their theological, political, or technocratic ambitions. Even when proponents of adaptation couched their proposals in the language of innovation, they justified their claims with elements from the past.

Dialogues of conflict that developed in the aftermath of the Christmas Flood focused on three issues: the divine causation of flooding, the financing of dike management, and the viability of technocratic solutions to flood risk. Conflict was not primarily between these concerns (indeed, they comingled and were codependent) but internal to them. Within each dialogue, conflict developed out of economic, exegetical, and practical considerations. Ultimately, the goal of much of the flood literature was to promote prescribed action, but also to enshrine the motivations for those beliefs in legal precedent, history, and cultural memory. Each dialogue of conflict actively claimed the past as justification for its position, whether in favor of or in opposition to change. The outcomes of these negotiations cannot be characterized as

necessarily progressive. Just as the flood did not spark revolutionary change, neither does this flood event neatly fit a gradualist, modernizing interpretation of disaster. Rather than being defined by either cumulative experience or the shock of catastrophe, the Groninger response is a case study in the importance of both. This balance resulted in a dialogue that stressed continuity and convention while simultaneously facilitating technological innovation.²²

Flood Response in Groningen

Victims and observers of the tragedy pressed the events into pre-existing modes of interpretation and action by crafting “causal stories” as a means of translating this disaster into responses that promoted defined positions.²³ These interpretive dialogues illustrated causation and responsibility for the disaster and can, in the broadest sense, be characterized into three categories. Just as with the first cattle plague epidemic, the first and by far most common dialogue was providential. The flood was the result of divine wrath and judgment against human sin. This interpretation was primarily employed by ministers and scholars and exhibited in their sermons and chronicles, though elements of providentialism were evident in almost all documents.

The second dialogue was institutional and predicated in a historically and geographically informed tradition of disaster management. According to this view, floods were partly environmentally determined and their mitigation required traditions of water management

²² This phenomenon is confirmed by social scientific models of policy change whereby change is catalytic, rarely creating “new” policy ideas. Clare L. Johnson, Sylvia M. Tunstall, and Edmund C. Penning-Roswell, “Floods as Catalysts for Policy Change: Historical Lessons from England and Wales,” *International Journal of Water Resource Development* 21, no. 4 (2005), 573.

²³ The “causal story” comes from the political science of agenda setting and is a useful model to define and explain methods of translating disaster events into action. See: Deborah A. Stone, “Causal Stories and the Formation of Policy Agendas,” *Political Science Quarterly* 104, no. 2 (1989): 281-300.

inscribed in law. The cultural memory of flooding and legal precedents for management informed institutional action. This dialogue was exhibited in governmental documents, especially those referencing conflicts between the city of Groningen and its hinterlands.

Lastly, Groninger technocrats employed the rhetoric of natural causation and its adaptive counterpoint, the human control of nature. Dike engineers in particular depended upon an optimistic view of their ability to control large floods as evidenced in their designs and journals. Their focus on dike engineering was the only dialogue that actively promoted innovation. Institutional reticence and an engrained cultural pessimism regarding dikes embedded in the cultural memory of flooding hindered these plans.

The Providential Reading

“Unclose your ears, but above all your heart, so that wise and level-headed, you may search with me after the source of such a bitter disaster,” wrote poet Adriaan Spinniker.²⁴ A Baptist minister from Groningen, Spinniker voiced an opinion that transcended most Protestant confessional differences and pointed to a common divine origin for catastrophes. “It is God,” wrote Spinniker, who is responsible for “the roar of this hurricane that brought the furious waves, it is God who brought the water and thrust it over the dike, and it is God who took the reins of the winds and floods.”²⁵ Lives lived outside God’s direction were the principal explanation for flood events.

Just as with cattle plague, providentialist interpretations of flooding remained a viable interpretive framework into the nineteenth century and many North Sea coastal communities

²⁴ Adriaan Spinniker, *Gods Gerichten Op Aarde, Vertoond in Den Schrikkelyken Storm En Hoogen Watervloed, Op Den 25 En 25sten Van Wintermaand in 'T 1717de Jaar Voorgevallen* (Groningen: Jurjen Spandaw, 1718), 2.

²⁵ *Ibid.*, 17.

interpreted floods as active proof of his presence.²⁶ Whereas providentialist interpretations of cattle plague tailored their narratives, language, and lessons to bovine analogies from the bible, floods offered similar options. For instance, flood interpretations used nautical language to explain the Dutch relationship with God and the sea. God used providence to “steer” the ship of creation.

Providential interpretations of floods differed in other ways from cattle plague as well. While moralists similarly employed fasting, prayer, and penitence therapeutically (as evidenced in days of thanks, fasting, and prayer), they were less useful as preventive measures. Cattle plague was a slow onset disaster when compared to flooding. People could track the creeping approach of cattle plague across Europe and use prayer as a prophylactic. In the case of flooding, commentators more often employed providence in the wake of disaster, and in a more abstract, explanatory capacity. As a result, floods were divine punishments that warranted response, but they were also opportunities to interpret the will of God. When sermons, poems, or chronicles read the flood as judgment, they could be directed at any number of sins on a communal or individual level. On an interpretive level, the social and environmental chaos of the post-flood landscape could be proof of God’s presence, evidence of His wrath upon individuals, a reflection of the moral chaos of the community, or even proof of His grace.

Providential interpretations of floods also gave insight into the relationship between what contemporaries considered “natural” occurrences and what were divinely-directed events and specified to whom those punishments were directed. Divine agency was rarely understood

²⁶ See, for example, G.J.F.C. von Baumgarten, *De Kersvloed Van 1717, in Gesprekken Ter Herinnering Van Dien Verschrikkelijken Watersnood, Voor 1817* (Groningen: R.J. Schierbeek, 1817). This fictional dialogue published on the centennial anniversary of the Christmas Flood is largely a providential document.

outside general providence. There is evidence that floods (especially smaller floods) were interpreted as mundane, “natural” events.²⁷ This is not to say that those floods were secularly interpreted, only that their interpretation fit within the framework of the *ordinary* workings of nature. Theologians and clergymen could read nature like a book and even small floods could be interpreted as the “footprints of God.”²⁸

Flood disasters challenged this interpretation and an event like the Christmas Flood necessitated “unnatural” or special interpretations and greater attention to the theological origins of the event. When the winds shifted to the northwest on Christmas Eve, Groningers interpreted this as a divine act.²⁹ Jacob Harkenroht, an East Frisian minister from Emden, noted as much in his account of the storm, referencing John 3:8 “according to God’s command, the wind blows where it will.”³⁰ This statement was equally true of smaller floods, but the consensus of post-disaster literature indicated this was a special punishment. God’s will asserted; all that remained

²⁷ A. M. J. De Kraker, “Two Floods Compared: Perception of and Response to the 1682 and 1715 Flooding Disasters in the Low Countries,” in *Forces of Nature and Cultural Responses*, ed. Katrin Pfeifer and Niki Pfeifer (Dordrecht: Springer, 2012).

²⁸ For more on the Dutch reading of the “Book of Nature” see: Eric Jorink, *Reading the Book of Nature in the Dutch Golden Age, 1575-1715*, trans. Peter Mason (Leiden: Brill, 2010). Philipp Melanchthon, *Vorlesung zur Geographie*—reproduced in Dietrich Hagen, “Der Deichbruch Als Gottesurteil? Zur Deutung Einer Naturkatastrophe Am Anfang Des 18 Jahrhunderts,” in *Ostfriesland Und Das Land Oldenburg Im Schutz Der Deiche Und Weitere Wasserhistorische Beiträge*, ed. C. Ohlig, *Schriften Der Deutschen Wasserhistorischen Gesellschaft (Dwhg) E.V* (Norderstedt: Books on Demand GmbH, 2005), 186-196.

²⁹ Manfred Jakubowski-Tiessen identifies a similar trend in affected German regions. Jakubowski-Tiessen, “Harte Exempel Göttlicher Strafgerichte”. Kirche Und Religion in Katastrophenzeiten: Die Weihnachtsflut Von 1717,” 12. Many providential accounts list the turning of winds to the northwest as a pivotal moment and indicative of God’s command of natural forces. See, for example, H.F., *Treurdigt Ter Droeviger Gedagtenisse Van De Vreeselyken En Verderffelyken Watervloed Den 25sten Van Wintermaan Mdcxvii En Enige Volgende Dagen, Gebragt Oover Holland, Friesland, Omlanden En Derselver Naburen* (Amsterdam: Johannes Douci, 1718), A3; Spinniker, *Gods Gerichten Op Aarde, Verdoond in Den Schrikkelyken Storm En Hoogen Watervloed, Op Den 25 En 25sten Van Wintermaand in 't 1717de Jaar Voorgevallen* (Groningen: Jurjen Spandaw, 1718), A2. This was likely a widely adopted position amongst the protestant North Sea coastal communities.

³⁰ J.I. Harkenroht, *Oostfriesche Watersnood in Eene Kerkreeden over Den Kersvloed Van Het Jaar 1717 Ende Deszelfs Kort Ontwerp: Als Mede Een Kort Verhaal Des Nieujaarsvloed Van Het Jaar 1720. Met Oudheden En Prentverbeeld, Ook Des Dollarts Uit(Ge)Breidd* (Emden: H. van Senden, 1723), 14.

was to determine His motivation. It was difficult to identify individual people or even local communities responsible for the events due to the widespread destructive capacities of large floods. Commentators identified a variety of general sins that were applicable on a communal or individual scale. One of the most frequently cited was the communal sin of forgetting God's previous lessons in the form of past floods.

Much as contemporaries used bovine allegories from the bible to interpret cattle plague, moralists employed Noah's Flood (*zondvloed*) as a lesson in the wake of floods. Even more frequently, respondents compared ongoing disasters to regional floods of the past. In the case of the Christmas Flood, for instance, numerous publications referenced the St. Martin's Flood of 1686 and many cited even more distant disasters. The author of the *Elegy* offered the semi-mythical Dollard Flood of 1277 (referred to as the first Christmas Flood) as a fitting example of the forgotten relevance of past sin when "God removed his sharp, polished dagger, and punished our wicked, thankless people."³¹

Memory played an important interpretive role in the interpretation of flood disasters, much as it did for cattle plague. Whereas memories of Arcadian plenty during the Golden Age past contrasted with plague times and warned of future disasters, flood literature often focused its attention on specific historic events. Clergymen, poets, historians, artists and occasionally

³¹ H.F., *Treurdigt Ter Droeviger Gedagtenisse Van De Vreeselyken En Verderffelyken Watervloed Den 25sten Van Wintermaan Mdccxvii En Enige Volgende Dagen, Gebragt Oover Holland, Friesland, Omlanden En Derselver Naburen* (Amsterdam: Johannes Douci, 1718), A3. Otto Knottnerus found that this 1277 flood actually occurred in 1509, which underscores both the value of these "mythical" floods as rhetorical strategies as well as a pitfall of taking contemporaries accounts to literally. Otto S. Knottnerus, "Dollardgeschiedenis(Sen) : Mythe En Realiteit," in *Stormvloed 1509: Geschiedenis Van De Dollard*, ed. Karel Essink (Groningen: Stichting Verdrongen Geschiedenis, 2013).

cartographers preserved the memories of these disasters in their literature, prints, and maps.³² In fact, remembrance (or more accurately, the fight against forgetfulness) was one of the primary goals of these documents. Jacob Harkenroht, for instance, stated in the preface to his sermon on the Christmas Flood that his goal was to provide a lesson whereby “God’s righteous judgment would not be so quickly forgotten.”³³ Flood history and memory were appropriate tools to combat the sin of forgetfulness.

Providential interpretations employed rhetoric of individual moral improvement as well. Groninger clergymen, for instance, connected the events of the Christmas Flood with the misbehavior of their parishioners. Accusations were oftentimes vague or non-descript, but they could be associated with vanity, pride in one’s wealth and status, and a failure to attribute that wealth to God. Groninger lawyer Johan Kemner, for instance, accused Groningers of “unfaithfulness, pride, adorned with frivolous clothes, with tresses and painted faces” as well as “wantonness and excess.”³⁴ Commentators could level charges against entire regions or even the country as a whole and commentators frequently bolstered their claims with biblical evidence. Kemner, for instance, drew on Psalm 107:34 (“a fruitful land into barrenness, for the wickedness of them that dwell therein”) to indict Dutch prosperity. He contrasted the past bounty of the Netherlands, inscribed in cultural memory and history, with post-flood destitution. These statements resonated in a period of broader decline. “The power of the Netherlands is broken,”

³² See Dietrich Hagen’s analysis of the map of the Christmas Flood by Johan Baptiste Homann. Hagen, *Die Jämmerliche Flut Von 1717*.

³³ Harkenroht, *Oostfriesche Watersnood in Eene Kerkreeden*, preface.

³⁴ J. Kemner, *De Suchtende Landtman in De Provincie Van Stadt Groningen En Ommelanden over De Hooge Water-Vloedt Op Kers-Tydt Den 25. Van Winter-Maandt in Het Jaar Onses Heeren 1717* (Groningen: Johannes van Velsen, 1718), 7-8. Peter Kremer draws a distinction between “particular” (the Deluge) and “private” flooding which was more regionally defined. Peter Kremer, “Wenn Der „Blanke Hans“ Zur Sintflut Wird,” in *Mensch Und Meer, Küste Und Marsch*, ed. M. Fansa (Oldenburg: Landesmuseums für Natur und Mensch Oldenburg, 2006), 14.

he proclaimed, “robbed of grain and wheat fields, the fattened land turned to salted ground.”³⁵

Flood commentators contrasted their current situation with visions of Golden Age bounty to highlight God’s wrath and to dampen the conflict between individual vs. communal sin by focusing on the widespread result of their indiscretions.

Literature was not the only medium that conveyed flood memory and meaning. Visual representations sometimes captured the providential nature of retribution. Flood imagery was not copious but it had a long tradition in the Low Countries that extended into the medieval era. Disasters imagery immortalized events from the St. Elizabeth’s Flood (1421) to the St. Martin’s Flood (1686) and beyond. They portrayed the historical event as well as the psychological and providential drama of the disasters.

³⁵ Kemner, *De Suchtende Landtman*, 5.



Figure 3.2 Romein de Hooghe, St. Elisabeth's flood, 1421, from Matthys Balen Jansz's *Description of the City Dordrecht* (*Beschryvinge der stad Dordrecht*), Simon onder de Linde, Dordrecht, 1677. Produced 250 years following the flood it depicts, this image highlights the providential nature of the seventeenth-century interpretation. The centrality of the clerical figure whose tunic is emblazoned with a cross underscores this interpretation.

In this seventeenth-century depiction of the St. Elizabeth's Flood of 1421, Romein de Hooghe depicts the aftermath of a massive flood that killed at least 2,000 people and overwhelmed the fertile southern Dutch river region called the *Grote Hollandse Waard*.³⁶ (Figure 3.2) The flood devastated the countryside; permanently destroying dozens of villages, making the city of Dordrecht (pictured) an island, and irrevocably altered the landscape.³⁷ De Hooghe's print appeared over 250 years after the St. Elizabeth's Flood (and only two years after his print of the 1675 flood), but it offers several useful clues, particularly in its staffage, that highlight the enduring role providence played in the construction of disaster ideas. In the background, floodwaters inundate villages up to the high horizon, which De Hooghe identifies as a list of "drowned villages" in the upper right corner. People and cattle swim (or drown) in the background as many struggle to reach the higher elevations of the left foreground.

Its composition and subject matter hearken to a near contemporary depiction of the flood now hanging in Amsterdam's *Rijksmuseum* painted by the so-called Master of the St. Elizabeth's Panels. (Figure 3.3) Just as with the later De Hooghe print, the background works to document the spatial extent of the flood as well as the names of the drowned villages, though in a more flattened style in keeping with its medieval context. River water streams through the dike breach in the upper right corner of the right panel. The later De Hooghe print echoes the staffage in the foreground who are experiencing the trauma of a catastrophic flood. Dead bodies float in the

³⁶ Most early modern sources claim the flood killed at least 10,000 people. Just as with the 1277 flood, recent research has underlined the fluid and inexact nature of flood memories. Karel Leenders, "'Die Inundatie Ende Inbreck Van Onsen Grooten Waert': De Verdrinking Van De Grote Waard," in *'Nijet Dan Water Ende Wolcken': De Onderzoekscommissie Naar De Aanwassen in De Verdrongen Waard (1521-1523)*, ed. Valentine Wikaart (Tilburg: Stichting Zuidelijk Historisch Contact, 2009), 70.

³⁷ The region was largely un-reclaimed following the flood and is now a national park called the *Biesbosch*.

river, cattle and peasants struggle to reach higher ground, and a stream of survivors collects their belongings to head into Dordrecht.

Whereas explicit references to providence are nearly absent in the fifteenth-century painting, divine retribution is central to the De Hooghe retelling two and a half centuries later. As opposed to the medieval depiction, which places peasants in the foreground, the central figure in the De Hooghe print is a minister standing with arms upraised and his chest emblazoned with a cross, appealing to God for respite.³⁸ While providence exerted a powerful role on Medieval ideas of flooding as well, this image centralizes God's wrath as a causal argument for the St. Elizabeth's Flood—an increasingly common trope throughout the period of disaster.³⁹

³⁸ Simon Schama notes that the persistence of this flood in disaster imagery highlights its moral and symbolic role as a primeval catastrophe. Simon Schama, *The Embarrassment of Riches : An Interpretation of Dutch Culture in the Golden Age* (New York: Knopf, 1987), 37.

³⁹ The less explicit depiction of providence in the medieval painting may be a result of the lesser emphasis on providence as an explanatory tool in the, then, Catholic low countries. As Protestantism increasingly rejected the “miraculous” in theological explanations of natural occurrences, providence gained prominence.



Figure 3.3 Master of the St. Elizabeth's Flood Panels, *The Saint Elizabeth's Day Flood* (*De Sint-Elisabethsvloed*), ca. 1490 - ca. 1495. Just as with the later De Hooghe print, this painting emphasizes the scale of the St. Elizabeth's Day Flood. Unlike the later image, however, providentialism does not occupy a position of interpretative significance.

Punishment, however, was not the only rubric against which observers could gauge God's will. Special providence held that during a flood event, God could will miraculous rescues.⁴⁰ On this level, individual vs. communal salvation was again a salient issue and accounts emphasizing this point fill the theological literature. One of the most oft-repeated stories from the Christmas Flood of individual salvation came from the Dutch town of Kloosterburen where a large "tjalk" (barge) "was launched by the waves, not through, but over the dike...and onto the house of a shoemaker."⁴¹ The ten people clinging to the roof of the shoemaker's house climbed aboard this ark and God's special providence ensured that a further thirty people were saved the next morning. Despite the specificity of this story, there was no indication why these particular people deserved God's special providence. It is more an illustration of the existence of grace.

Visual depictions of the flood also highlighted the providential nature of rescue and the symbolic importance of staffage. For instance, moralist Jan Luyken's illustration of the St. Martin's Flood of 1686 adheres to a similar providentialist message as the De Hooghe print, although expressed in a more intimate composition. (Figure 3.4) In the background, cattle and people struggle to find high ground as the storm rages around them. Upturned houses and a

⁴⁰ This was despite the Protestant program of de-emphasizing miracles, which were seen as a relic of a superstitious Catholic past. Indeed, J.C.D. Clark argues that miracles were in some ways preserved within the notion of providence. J.C.D. Clark, "Providence, Predestination, and Progress; or Did the Enlightenment Fail?," in *Ordering the World in the Eighteenth Century*, ed. F. O'Gorman and D. Donald (Palgrave Macmillan, 2006), 39.

⁴¹ A.E. Crous, *Opregt En Nauwkeurig Historis-Verhaal Van De Verwonderenswaardige, Droevige, Schrikkelike En Seer Schaadelike Waters-Vloed, Voorgevallen in De Provincie Van Groningen En Ommelanden, Op Kersdag Den 25. December Ao. 1717: Daarom Met Regt Genaamt De Kers-Vloed of Midwinters-Vloed. : Met Al 'T Geene in Deselve, Aanmerkelijk Is Voorgevallen ... : Beneevens Een Byvoegsel Van 'T Aangrensend Oost-Vriesland, En De Daar Bygeleegene* (Seerp Bandsma, 1719), 19. This story may be apocryphal as there were multiple versions of this story described in various parts of Germany and the Groningen. Some of these stories were pictured in Johan Baptiste Homann's famous map of the flood, though Kloosterburen was outside the pictured area. In his analysis of Homann's map, Dietrich Hagen argues that the story is plausible considering the shallow draft of most merchant vessels. Hagen, *Die Jämmerliche Flut Von 1717*, 55.

nearby village are all that distinguishes their watery surroundings from the open sea. Rather than a landscape of disaster observed from a slightly heightened vantage point like that of the St. Elizabeth's Flood, instead the viewer is drawn close to a desperate family stranded on a hay bale. This composition highlights the same personal nature of special providence highlighted in textual stories of individual salvation.



Figure 3.4 Jan Luyken, *Flood in Groningen*, 1686 (*Watersnood in Groningen*, 1686), 1698. Luyken's flood scene follows in the vein of De Hooghe's earlier print by focusing on providential rescue. Luyken's image is more personal and focuses on individual salvation, whether in the case of the people clinging to the haybale or the child floating in its crib.

Luyken's image clearly conveys its providential message in both the family's gestures of desperation and pious prayer as well as the infant floating in its cradle. In fact, the baby in a cradle was a popular motif in Dutch flood folklore and imagery dating back at least to the St. Elizabeth's Day Flood and possibly centuries earlier.⁴² Depicted as minor details in both the contemporary Master of the St. Elizabeth's Panels as well as De Hooghe's print, this particular providential story assumed a more central importance to Luyken. (Figure 3.5) The story recounts the miraculous survival of a child in a cradle who eventually washes ashore unharmed.⁴³ Aside from being a symbol of enduring hope, both the De Hooghe and Luyken prints highlight dual sides of providence, trial and divine retribution as well as the possibility of miraculous rescue.⁴⁴

⁴² In literature, most histories link the cat and cradle story to the St. Elizabeth's Day flood, though there is evidence that it existed as early as the eleventh century. Ruben A. Koman, *Bèèèh, Groot Dordts Volksverhalenboek / Druk 1* (Bedum: Profiel Uitgeverij, 2005), 99-110. The story was identified in several images from the 15th to the nineteenth century in Henri Waal, *Drie Eeuwen Vaderlandsche Geschied-Uitbeelding, 1500-1800: Een Iconologische Studie* (M. Nijhoff, 1952), 98-101. The story was also transmitted to England and Italy, possibly as early as the sixteenth century. It later appeared in English paintings of their own floods. Julian Treuherz, "The Cat and the Cradle," *Journal of the Warburg and Courtauld Institutes* 46(1983): 240-42. Interestingly, this story has persisted in popular Dutch culture today. The flood disaster film *De Storm* (2009) follows a young mother searching for her child (initially floating in a cradle) following the 1952 flood in Zeeland.

⁴³ The story often includes a cat (though it is not depicted in the Dutch images) who balances the cradle in order to keep it from tipping. The girl's name was Beatrix and she would later be linked to a long line of important leaders of Dordrecht. Matthys Balen, *Beschryvinge Der Stad Dordrecht: Vervatende Haar Begin, Opkomst, Toeneming, En Verdere Stant; Opgezocht, in 'Tlicht Gebracht, En Vertoond, Met Vele Voornamen Voorrechten, Hand-Vesten, Keuren, En Oude-Herkomen; Als Mede Een Verzameling Van Eenige Geslachtboomen, Der Adellijke, Aal-Oude, En Aanzienlijke Heeren-Geslachten Van, En in, Dordrecht, Enz* (Dordrecht: Symon Onder de Linde, 1677), 770. Like much of this folktale, Beatrix is largely apocryphal. For an historical accounting of the possible origins of the cat and cradle folktale, see: Koman, *Bèèèh, Groot Dordts Volksverhalenboek / Druk 1*.

⁴⁴ Matthys Jansz. Balen, *Beschryvinge Der Stad Dordrecht: Vervatende Haar Begin, Opkomst, Toeneming, En Verdere Stant; Opgezocht, in 'Tlicht Gebracht, En Vertoond, Met Vele Voornamen Voorrechten, Hand-Vesten, Keuren, En Oude-Herkomen; Als Mede Een Verzameling Van Eenige Geslachtboomen, Der Adellijke, Aal-Oude, En Aanzienlijke Heeren-Geslachten Van, En in, Dordrecht, Enz* (Dordrecht: Symon Onder de Linde, 1677). The baby is identified as letter B in the image's legend as "Het kint in de wiegh ghesalveert."

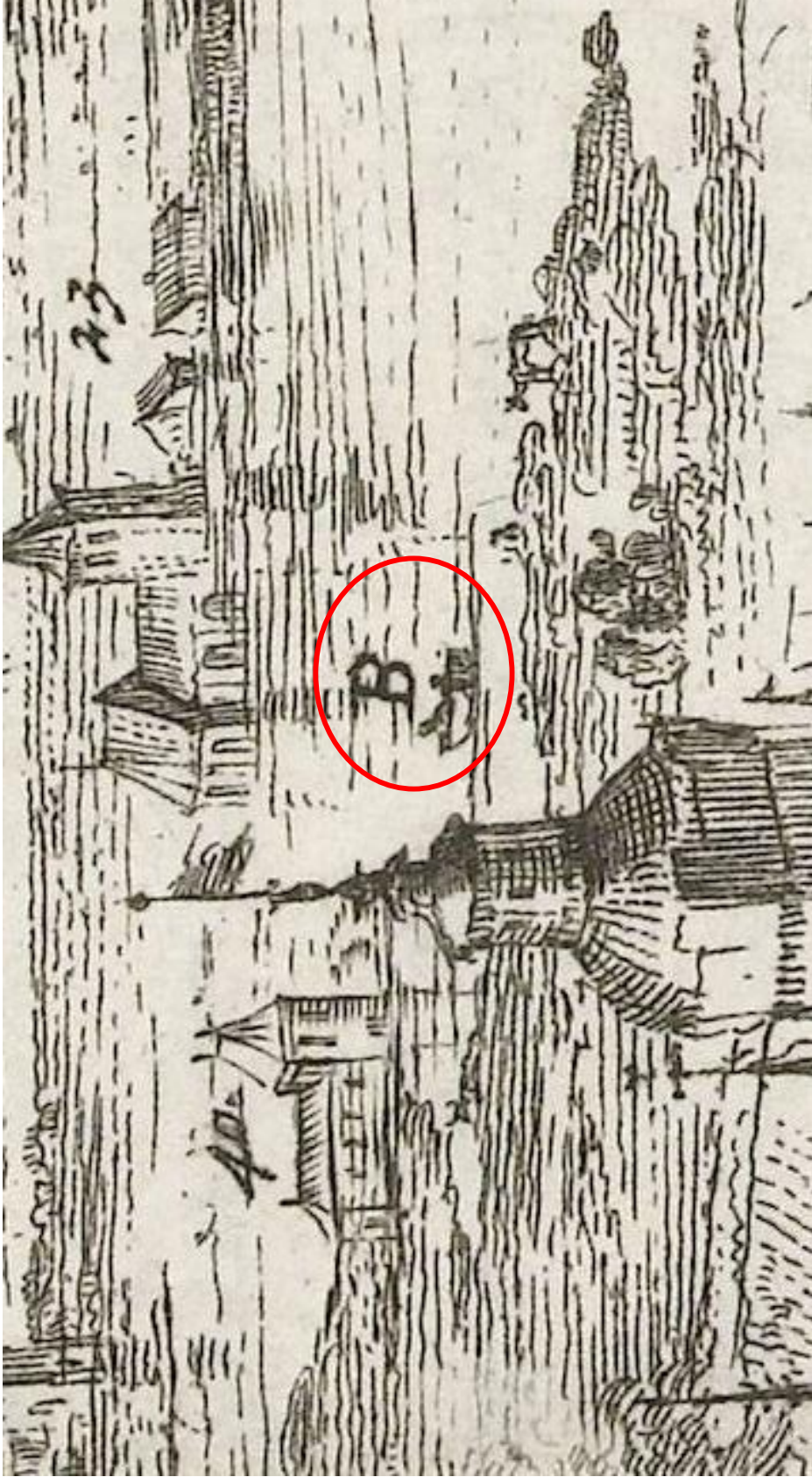


Figure 3.5 Detail of Romein de Hooghe's "St. Elisabeth's Flood, 1421," from Matthys Balen Jansz's *Beschryvinge der stad Dordrecht*, 1677. The baby in the crib was a pervasive symbol in flood imagery during the early modern period.

Both providential meanings appear in a print of the Christmas Flood that appeared in a German almanac in 1719.⁴⁵ (Figure 3.6) The “almost miraculously high” floodwater in this anonymous copper engraving underscored the “special” character of this flood and contrasted the wrath of God with his beneficence.

⁴⁵ Philomon Adelsheim. *Neuer Und Verbesselter Kriegs-,(,) Mord- Und Tod-,(,) Jammer- Und Noth-Calender/ Auf Das Jahr Nach Der Gnadenreichen Heiligen Geburt Unsers Herrn Und Heilands Jesu Christi M Dcc Xix. In Welchem Nebenst Der Beschreibung Des Gewitters/Erwehlungen/Der Planeten Lauff Und Gang/Samt Deroselben Natürlichen Zuneigungen/ Auch Zu Finden Ist Eine Ausführliche Beschreibung Der Entsetzlichen Stürme/ Und Daher Verursachten Fast Über Natürlich-Hohen Wasser-Fluten/ Womit Gottes Hand Am H.(Eiligen) Christ-Tag 1717, Und Den 25. Hornung (= Februar) 1718 Die Länder an Der Nord-,(,) Süder- Und Ost-See Heimgesuchet, Nebst Einem Kupfer/Welcher Diese Strafe Gottes Deutlich Vorstellet.* 1719. F-A 80. Gottfried Wilhelm Leibniz Bibliothek.



Figure 3.6 Illustration of almost supernatural-high water flood on Christmas 1717 and 25 February 1718 (*Abbildung der fast übernatürlich-hohen Wasserflut am H. Christ-Tag 1717 und am 25. Hornung 1718*). This German image visualizes the devastation of the Christmas Flood as well as the next flood in 1718 which did not affect Groningen to the same extent. This image operates equally as a document of flood memorialization and interpretive argumentation. The title and the visual primacy of rescue assert its providential character. This image is included and folded in the almanac by Philomon Adelsheim: *Neuer und Verbesselter Kriegs-Mord- und Tod-Jammer- und Noth-Calender/ Auf das Jahr nach der gnadenreichen heiligen Geburt unsers Herrn und Heilands JESU Christi M DCC XIX. In welchem Nebenst der Beschreibung des Gewitters/Erwehlungen/der Planeten Lauff und Gang/samt deroselben natürlichen Zuneigungen/ auch zu finden ist Eine ausführliche Beschreibung Der entsetzlichen Stürme/ und daher verursachten fast über natürlich-hohen Wasser-Fluten/ womit GOTTes Hand am H. Christ-Tag 1717, und den 25. Hornung 1718. die Länder an der Nord-Süder- und Ost-See heimgesuchet, Nebst einem Kupfer/welcher diese Strafe GOTTes deutlich vorstellt*. Verlag Johann Andrea Endters sel. Sohn und Erben, Nürnberg 1719. Gottfried Wilhelm Leibniz Bibliothek Niedersächsische Landesbibliothek, F-A 80.

Even the title admits the possibility that this flooding occurred outside the ordinary workings of nature, or general providence. “Almost unnatural” here implies the suspension of the general state of providence, an action reserved for God.⁴⁶ This image also closely mirrors the written accounts provided in chronicles of the flood. Water streams over the dike and blankets the entirety of this landscape with only a distant city protected by its high city walls remaining dry. A few survivors await rescue on the roofs of houses or churches, but many more cling to the flotsam washed free in the aftermath of the dike breach. The devastation wrought by the flood is background to the multitude of ships, large and small, sent out to rescue the people floating on wreckage and trapped atop their houses.

Just as with the two earlier Dutch images, this vision contrasts tribulation with salvation. The continuity of visual disaster symbolism is perhaps most emphatically revealed in the presence of a baby in a cradle seen floating amidst the flood debris awaiting rescue. In this instance, the baby is once again minimized (as in the *Rijksmuseum* painting and the De Hooghe print) and subordinate to the larger chaos of the flood. (Figure 3.7) However, like the Luyken print, the images of rescue (in this case the ships) occupy a central place in the composition. Little art historical scholarship focuses on disaster imagery, though this possible trend of greater emphasis on salvation in providentialist imagery may be worthy of investigation.

⁴⁶ The choice to characterize floods as “miraculous” is interpreted by Marie Luisa Allemeyer as indicative of developing separation between God and the sea; a transition that later disembeds God from most normal or periodic floods. Allemeyer, *Kein Land Ohne Deich*, 330-371. This ability to suspend the “rules of nature” or not is one aspect of the doctrine of the “radical sovereignty” of God over nature advocated both by Calvin and Luther. God, in effect, was the only prime mover of nature relegating nature to a passive vessel whereby God was the only actor. Gary Deason argues that this condition prompted the mechanistic worldview as it was a real break from Aristotelian concepts of nature. Gary B. Deason, “Reformation Theology and the Mechanistic Conception of Nature,” in *God and Nature: Historical Essays on the Encounter between Christianity and Science* (Berkeley: University of California Press, 1986).

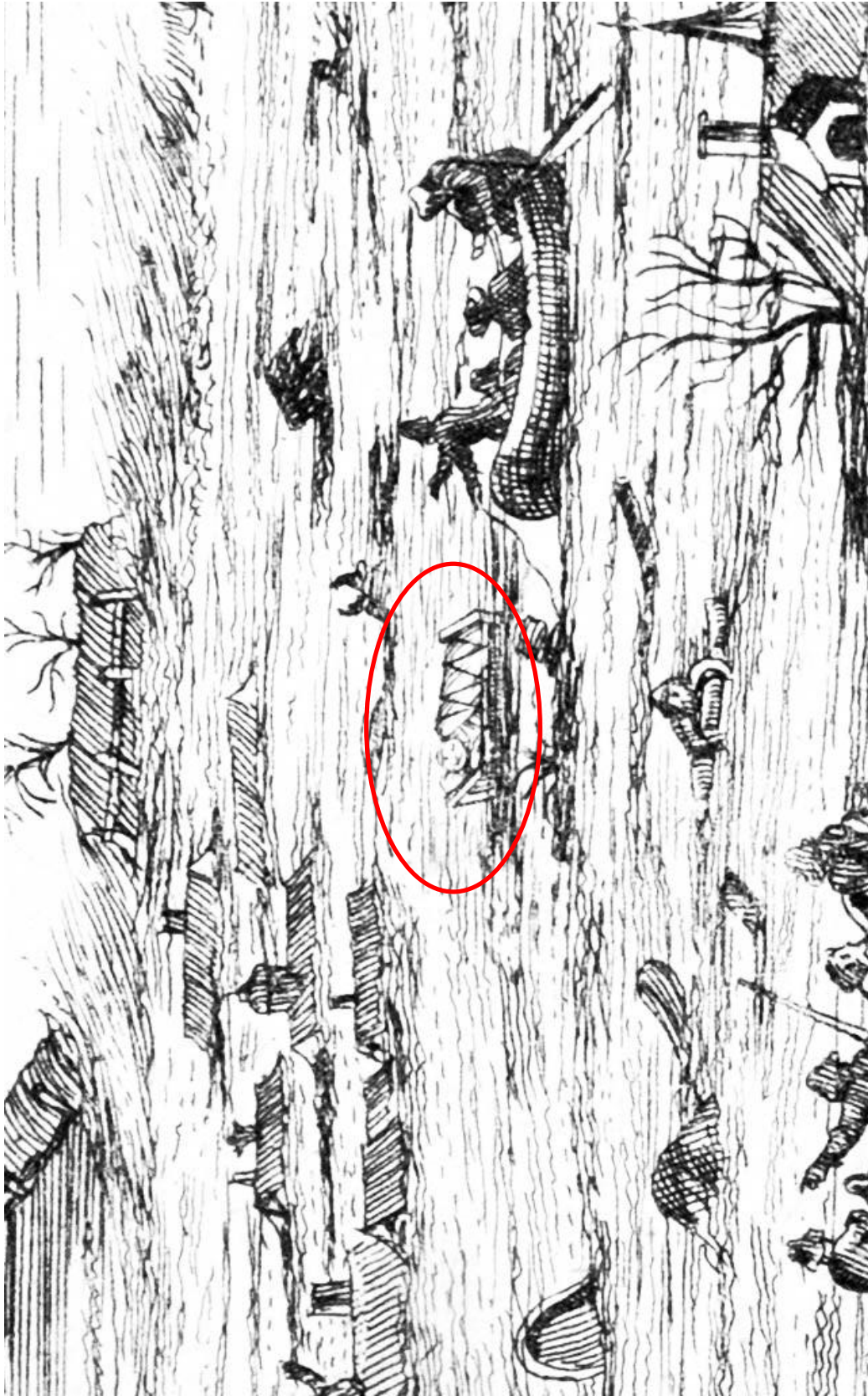


Figure 3.7 Detail from anon. Copper Engraving. *Illustration of almost supernatural-high water flood on Christmas 1717 and 25 February 1718, 1719.* The baby in the cradle symbol once again makes an appearance in the German print, indicating not only its resilience across time, but the story's power across territory.

In literature as much as artwork, providence extended from personal stories of salvation to entire communities or cities. Gerhardus Outhof, for instance, noted in his chronicle that “we were truly surprised by God’s special providence that in our entire city, not more than...two people were killed.”⁴⁷ Communal providence was, therefore, a key component in the moral geography of Groningen. Importantly, post-flood calls for moral improvement did not necessitate substantive ideological changes in Groningen; they only retrenched the population in pre-existing modes of thinking. The dominant response was to memorialize and reflect. Significantly, few specific moral changes were required because commentators chose vague and easily negotiable illustrations of malfeasance and rescue. Response was more indicative of a conservative, resilient ideology of moral causation than adaptation to a changed moral landscape.

The event of the Christmas flood, therefore, does not easily fit into a progressive narrative of disaster experience and secularization. On 5 January 1718, when the provincial assembly of Groningen declared a “day of fasting and prayer” so that God would “raise his angered and destructive hand from the province,” it listed no specific sins as responsible aside from an implied reference to forgetfulness.⁴⁸ This last feature highlights the importance of

⁴⁷ G. Outhof, *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden, in Meest Alle Plaatsen Van Europa, Van Noachs Tydt Af, Tot Op Den Tegenwoordigen Tydt Toe: Met Een Nieuw Kaertje Van't Verdrongen Landt in Den Dollaart, Afbeeldinge Van Kosmas En Damianus En Van Den Steenenman in Vrieslandt: Met Eene Breede Beschryvinge Van Den Zwaaren Kersvloedt Van 1717, En Bygevoegde Tafels Der Watervloeden* (voor de wed. A. van Laar, 1720), 649.

⁴⁸ *Plakkat* (1 Jan) 1718. Staten van Stad en Lande. 1. 477. Groninger Archieven. *Dank, Vast, en Bededagen* were oft-employed tools in the wake of disasters (their use blossoming since the 16th century Dutch Revolt and the Synod of Dordrecht) and their implementation was evidence of the resilient power of providential rhetoric. For more on the relevance and origins of Days of Thanksgiving, see M.H.D. van Leeuwen and J. van Gerwen, *Zoeken Naar Zekerheid: Risico's, Preventie, Verzekeringen En Andere Zekerheidsregelingen in Nederland, 1500-2000* (Verbond van Verzekeraars, 2000), 393; A. Walsham, *Providence in Early Modern England* (Oxford University Press, 1999), 142-156; P. Biesterveld and H.H. Kuyper, *Kerkelijk Handboekje: Bevatende De Bepalingen Der Nederlandsche Synod En Andere Stukken Ven Beteekenis Voor De Regeering Der Kerk* (Kampen: J.H. Bos, 1905); Leo Noordegraaf,

claiming the past in the dialogue of providentialism. Groningers referenced a history that contrasted their situation with visions of Golden Age plenty (fruitful land into barrenness) and cited the failure of memory as a causal sin responsible for the disaster.

Institutional Response

Provincial institutions were not interested in framing the disaster according to one providential reading or another. The interpretation of floods produced little apparent conflict between governmental and religious institutions. In fact, a providential reading was favorable because it absolved governors from accusations of poor management. Fasting and prayer days were prominent examples of the government working in tandem with providentialist discourses. By leaving the issue of ultimate causation to the clergy, the province could shift attention to practical issues of governance and financing. Institutional conflict revolved around resilient (though malleable) interpretations of law, tradition, and history. The institutional negotiation of this disaster event only achieves clarity in the context of these long-term processes which evolved over centuries and *consistently* faced challenges, not always associated with disasters.

Following the Christmas Flood, urban factions within the city of Groningen (*Stad Groningen*) distanced themselves from financial responsibility for reconstruction and based their position on legal precedent. In the view of its hinterlands (the *Ommelanden*), this was a violent divergence from tradition and the recent history of dike management. Neither *Stad Groningen* nor the *Ommelanden* ever considered pre-flood divisions of responsibility viable options in the

"Of Bidden Helpt? Bededagen Als Reactie Op Rampen in De Republiek," in *Of Bidden Helpt? Tegenslag En Cultuur in Europa Circa 1500-2000*, ed. Marijke Gijswijt-Hofstra and Florike Egmond (Amsterdam: Amsterdam University Press, 1997); Peter van Rooden, "Dissenters En Bededagen. Civil Religion Ten Tijde Van De Republiek," *BMGN: Low Countries Historical Review* 107, no. 4 (1992).

post-flood political landscape. Nevertheless, both parties used interpretations of the past to bolster their positions. They tacitly acknowledged that change was necessary even if it was clothed in conservative rhetoric. These necessary changes resulted from evolving environmental conditions outpacing responses in governance. The increasing intervention of Groninger landowners in their local environments over the centuries as well as the growing complexity of water infrastructure set the stage for conflict following the flood of 1717.

Eighteenth-century Groningen was a largely pastoral province in the far northeast of the Netherlands, but its flood identity was tied to its northern coast: the Wadden Sea. The Wadden Sea is an intertidal zone of the North Sea situated between the northern Dutch coast (as well as parts of Germany and Denmark) and a chain of coastal “Frisian” islands. The tidal nature of the Wadden Sea restricted Groningen’s early settlement history because of the threat of frequent tidal inundation and storm surges.⁴⁹ The fertile soils, many of which were born out of this continual ebb and flow, pulled in significant immigration, especially for cattle grazing. This pastoral tradition continued into the seventeenth and eighteenth centuries.⁵⁰ The benefits of Groningen’s proximity to the Wadden Sea as well as the fertile nature of its soil composition were changeable features, however. Groningen’s soils were primarily comprised of sand, sea clay, and peat and the coastal zone in particular was a vacillating barrier against the intrusion of seawater. Sea dikes attempted to institute a permanent barrier amidst this chaos. This posed problems because dikes built on sandier soil (oftentimes the only available soil) were prone to dike breaches. Additionally, Groningen’s topography was bowl-shaped, with relatively higher

⁴⁹ L. Hacquebord and A.L. Hempenius, *Groninger Dijken Op Deltahoogte* (Groningen: Wolters-Noordhoff, 1990).

⁵⁰ Richard F.J. Paping, "De Ontwikkeling Van De Veehouderij in Groningen in De Achttiende En Negentiende Eeuw; Een Grove Schets," *Argos* 24(2001), 175.

elevations along the coasts than in the interior. This had the advantage of keeping the sea at bay, but also prevented water's escape during a flood. Land subsidence caused by economically lucrative peat excavation exacerbated these conditions and further depressed the deepest parts of the bowl.⁵¹

In response to these evolving environmental challenges, the inhabitants of Groningen developed and refined strategies intended to mitigate the effects of coastal flooding or prevent them entirely. The development of sea dike management institutions, known in Groningen as *dijkrechten*, were administrative adaptations to the growing complexity of water management that were largely independent of the province.⁵² Initially local organizations, by the eighteenth century the landscape of Groninger *dijkrechten* was far removed from their humble beginnings in village or monastic traditions. They held legal powers, oversaw complicated drainage schemes, and managed increasingly large and expensive dikes.

This evolution of management did not keep pace with rapid environmental changes such as land subsidence and the shifting of coastlines due to reclamation and flooding. Sea dike management required greater resources and oversight; so much that by the mid-seventeenth century, local administrators increasingly sought assistance from the province and *Stad Groningen*. Centralization of smaller *dijkrechten* ameliorated an overwhelming financial burden from landowners to pay for increasingly large and expensive dikes, but also removed direct

⁵¹ Hacquebord and Hempenius, *Groninger Dijken Op Deltahoogte*, 44. Peat excavation and resulting subsidence has been a reoccurring problem throughout Dutch history, not just in the Northern provinces, but Holland and the inland provinces as well. See: P.J.E.M. van Dam, "Sinking Peat Bogs: Environmental Change Holland, 1350-1550," *Environmental History* 6, no. 1 (2001).

⁵² For more on the development of Groninger water management, see: B.W. Siemens, *Dijkrechten En Zijlvesten* (Groningen: Tjeenk Willink, 1974). *Zijlvesten* concerned themselves with the drainage of the interior of the province, the construction and maintenance of canals and roads, and the governance of polders and sluice gates (*zijlen*).

authority from local managers to the increasingly powerful central city. The break with tradition did not occur without conflict.⁵³

Disputes over water management following the Christmas Flood developed out of historic tensions between *Stad Groningen* and the *Ommelanden*. This urban-rural division of provincial authority had its roots in the medieval era and vestigial antipathy still existed in the eighteenth century.⁵⁴ Initially, it seemed as if this conflict could be transcended. Groningen's efforts to coordinate rescue during and in the immediate aftermath of the flood received high-praise from the regents of the *Ommelanden*.⁵⁵ City-based disaster response was coordinated, effective, and desperately necessary. This brief period of amity ended, however, in 1718 when the *Ommelanders* took issue with the province's plan to finance dike repair.

On January 10, the provincial committee responsible for dike management (*Edele Mogende Heeren Gecommitteerden van Stad Groningen en Ommelanden Tot de Dijken cum plena*) offered a plan to the general governing body of Groningen (*Staten van Stad en Lande*) which consisted of representatives from *Stad Groningen* and the *Ommelanden*.⁵⁶ It required landowners whose property bordered a dike be primarily responsible for the repair. The inland inhabitants of the *Ommelanden* whose property was indirectly affected by floods (*hulpkarspelen*) would assist them. Significantly, this proposal removed the city (which was relatively

⁵³ This process of centralization was ongoing across the North Sea during the early modern period and was tied to a number of factors, which Milja van Tielhof identifies as 1. Well-developed market economy 2. State intervention 3. Reasonable relationship between length of dikes and protected areas 4. A flood catalyst. Although the other three conditions may reasonably have been met, state intervention was impossible in a province defined by its divisions. Milja van Tielhof, "Forced Solidarity: Maintenance of Coastal Defences Along the North Sea Coast in the Early Modern Period," *Environment and History* (forthcoming).

⁵⁴ G.A. Collenteur, G.A.C. Pim Kooij, and P. Kooij, *Stad En Regio* (Koninklijke Van Gorcum, 2010).

⁵⁵ *Resolutie (31 Dec) 1717*. Staten van Stad en Lande. 1. 30. Groninger Archieven.

⁵⁶ *Resolutie (10 Jan) 1718*. Staten van Stad en Lande, 1594-1798. 1. 30. Groninger Archieven.

undamaged by the flood) from the majority of financial responsibility for repair. *Stad Groningen* supported the proposal because it was conservative in scope having its roots in a much older tradition of water management. Historically, the city had been absolved of dike maintenance costs until the mid-seventeenth century and even then, it only contributed two-thirds of the costs of the wooden barriers that protected the seaside of dikes.⁵⁷ The requirement that *hulpkarspelen* assist the reconstruction efforts was not established in law, however. This provision was grounded more in historical than legal precedent. After the St. Martin's Flood of 1686, *hulpkarspelen* offered labor and funds in the repair effort. The city drew on both precedents as foundational to their plans.

The regents of the *Ommelanden* rejected this proposal. Faced with what they deemed an unreasonable burden upon an already beleaguered population, the *Ommelander* authorities replied that their "miserable residents" could not be expected to "help other, equally as unfortunate people, also up to their necks in water...whereas in this great disaster all residents of the province are interested in the salvation of the country being provided by assistance from the common treasury."⁵⁸ They based their arguments, not on legal precedent, but custom and the extraordinary nature of the disaster. Their defense of "customary law" did not refer to their expectation that the province (including the city) help fund repairs. Rather, it referred to the *hulpkarspelen* addendum; an expectation that ran contrary to their interpretation of tradition. Just as the city could bend tradition to include the enlistment of *hulpkarspelen*, the *Ommelanden* could employ custom to oppose it.

⁵⁷ W.J. Formsma, *Historie Van Groningen: Stad En Land* (Groningen: Wolters-Noordhoff, 1981), 624.

⁵⁸ *Resolutie (10 Jan) 1718*. Staten van Stad en Lande, 1594-1798. 1. 30. Groninger Archieven.

The *Ommelanders* also argued that the recent history of flood response offered a new precedent. The St. Martin's Flood of 1686 was the first disaster where the city assisted in repair efforts.⁵⁹ This precedent was even more relevant considering how much more severe the Christmas Flood was in comparison.⁶⁰ Casualties were lower and most dikes in Groningen were repairable following the flood in 1686. In 1718, the province was virtually a clean slate. Many dikes were completely gone and many more beyond repair.⁶¹

⁵⁹ Ufkes, "De Kerstvloed Van 1717: Oorzaken En Gevolgen Van Een Natuurramp," 70.

⁶⁰ Approximately 1,900 people died in the St. Martin's Flood. (almost 1,600 in Groningen) Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 133-138.

⁶¹ Beeldmateriaal rechtsvoorgangers. *Hoogheemraadschap Amstel, Gooi, en Vecht*. 80.

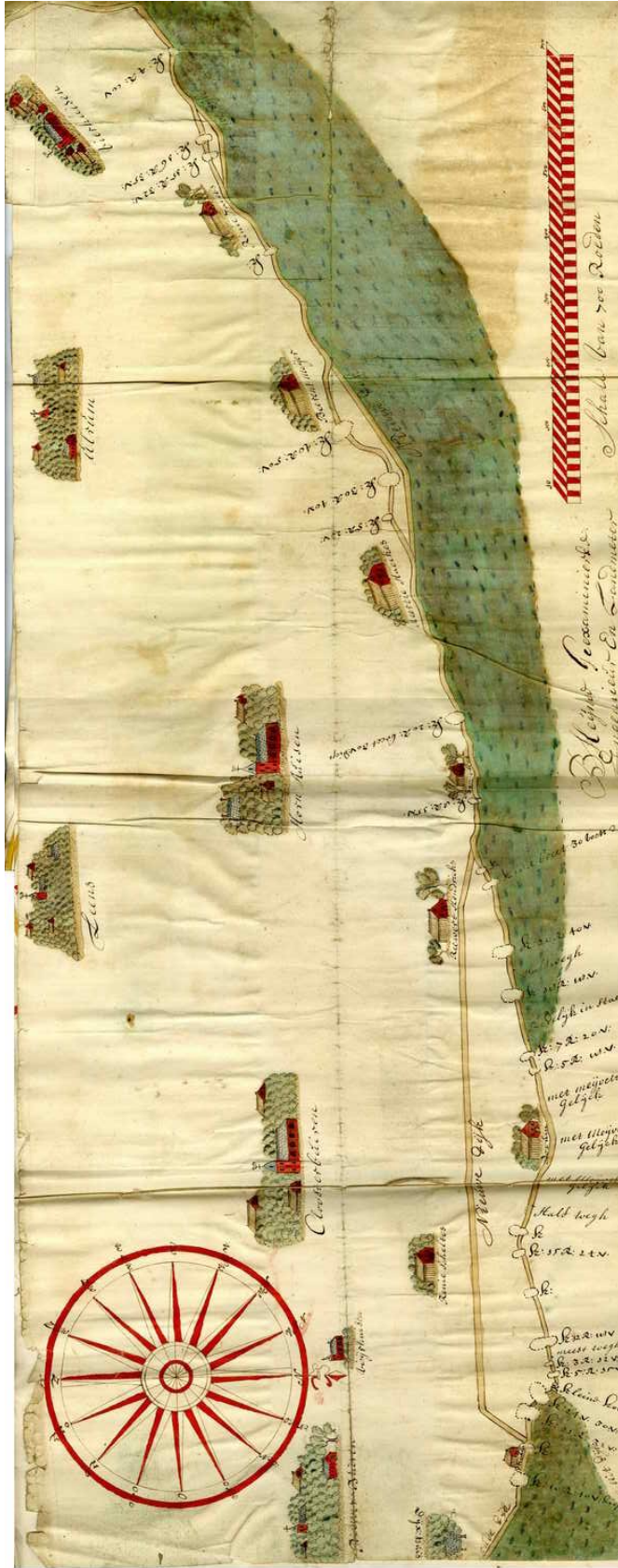


Figure 3.8 Barent Heijne, Map in color with north at the bottom with among other...with figurative depictions and names of owners of houses at the old and new dike and locations of kolken and dike breaches (Kaart in kleur met noorden onder van o.a. Pieterburen, Leens, Alrum, Vierhuizen tot Zoutkamp met figuratieve bebouwing en namen van eigenaren van huizen aan de oude en nieuwe dijk en plaatsen van kolken en dijkdoorbraken), 1723. In the wake of the Christmas Flood, mapmaker Barent Heijne produced this map of the affected region between the Groninger towns of Pieterburen and Vierhuizen as evidence of his skills for a position with the waterboard of Zeeburg and Diemerdijk near Amsterdam. It depicts towns, larger landowners near the sea, kwelders, and (importantly) the density and size of dike breaches. Historisch archief waterschap Amstel, Gooi en Vecht te Amsterdam.

Engineer and surveyor Barent Heijne's series of maps shows the effects of the Christmas Flood as well as the eventual repairs, but it is also an impressive visualization of the vulnerabilities of coastal communities in Groningen, the role of landscape in determining the site of dike breaches, and the extensiveness of repairs along the coastline. The map shows both the *Oude Dijk* (old dike) predating the flood and the *Nieuwe dijk* (new dike) built in the wake of the flood. (Figure 3.8) The *Oude dijk* meanders and shows evidence of dike breaches in the past. Heijne also depicts twenty six *dijkdoorbraaken* and *kolken* (dike breaches and the resulting scouring of land behind the breach) as well as their size and their locations along the *Oude dijk*. For a section of dike that scarcely ran ten kilometers, this was an incredible amount of destruction. One also notes the concentration of *kolken* that appeared in those areas not protected by *kwelders* (land extending beyond the seaward face of the dike, also called *voorland*) which he shaded in green. This land served an important wave-breaking function and those areas without *kwelders* were much more vulnerable. (Figure 3.9) One can observe from Heijne's map the extent of repairs, even on this small a scale.

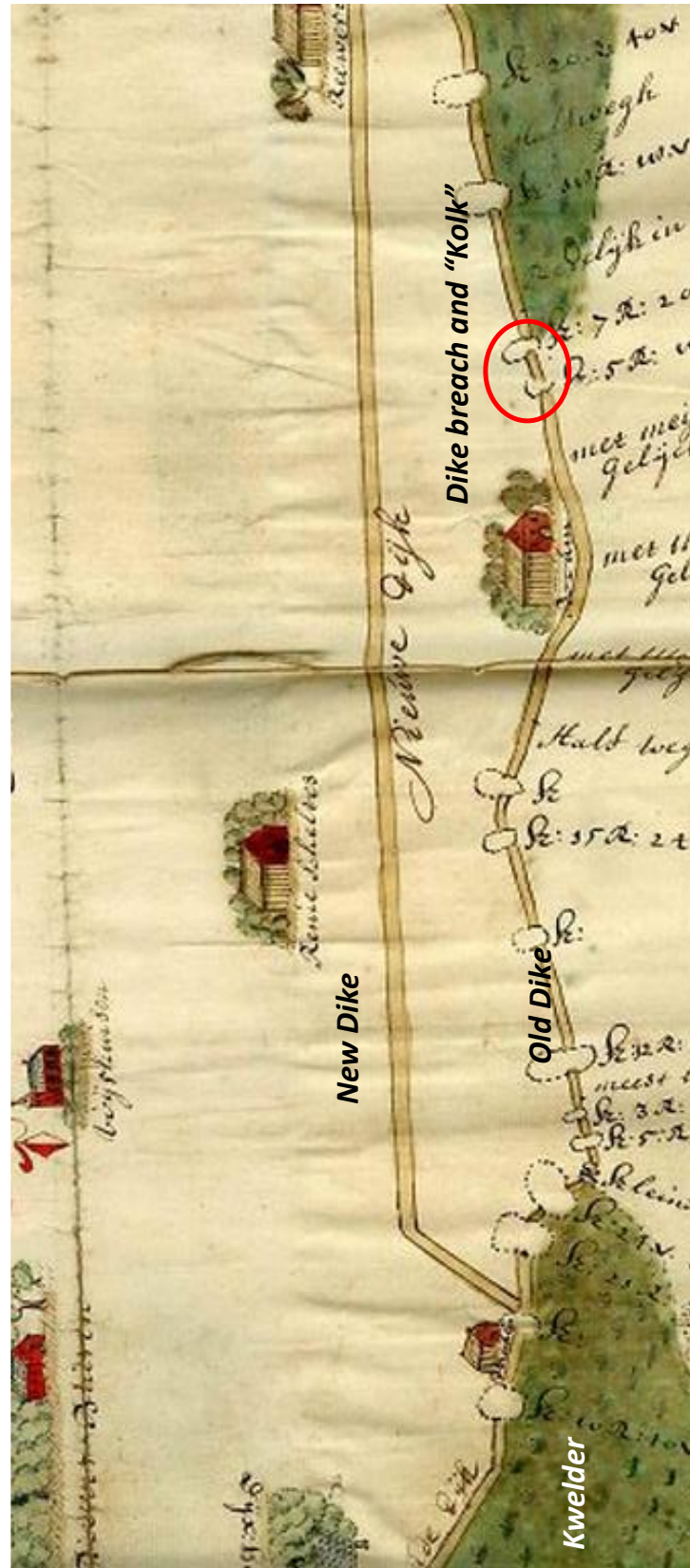


Figure 3.9 Detail of Barent Heijne, Map in Color with north at the bottom with among other...with figurative depictions and names of owners of houses at the old and new dike and locations of kolken and dike breaches, 1723. This detailed image of Heijne's map shows that not only did Heijne determine the location of dike breaches and "scouring holes" (kolken) behind broken dikes, but also the dimensions (in rods and feet) of the breaches. Historisch archief waterschap Amstel, Gooi en Vecht te Amsterdam

The financial cost and amount of labor necessary for reconstruction, especially in areas as hard hit as those depicted in Heijne's map, was much higher than following earlier floods. The costs of heightening or building entirely new dikes was nearly impossible for landowners to shoulder themselves and provincial decrees absolved landowners adversely affected by the disaster from taxation in the months following the flood.⁶² *Ommelander* requests went further. They wanted taxes broadly forgiven, regardless of the person's situation. In the view of the city, this request was a break with tradition and an attempt to broaden financial responsibility for flood events.

In the end, the *Staten van Stad en Lande* sought mediation from two outside bodies, the governors of neighboring Friesland (who wrestled with a similar issue in the sixteenth century) and eventually the *Staten Generaal* (governing body of the United Provinces).⁶³ Both responded similarly. They rebuked the province of Groningen for its disunity, which threatened further destruction by ignoring the historically vulnerable position of the province.⁶⁴ Groningen was susceptible to flooding, a situation the *Staten* acknowledged when they admitted that "because of the far-advanced season, the damaged dikes, which remain entirely open to the sea, and therefore the province being exposed to total ruin, must be speedily repaired."⁶⁵ This outside judgment reopened the dialogue of flood causation and blame—issues that had been assiduously avoided.

⁶² This situation was not permanent however, and the Governors of Groningen were already requiring sums to be paid by May 1718. *Plakaat* (25 May) 1718. *Staten van Stad en Lande*. 1. 477. Groninger Archieven.

⁶³ For more on the sixteenth century disputes and their resolution in Friesland, see C. Tolle, "Tweedracht Maakt Zacht. Conflicten Binnen Een Fries Waterschap (1533-1573)," *Leidschrift* 28, no. 2 (2010). Mediation within provinces by the *Staten Generaal* also extended to conflicts between provinces. See: Hotso Spanninga, *Gulden Vrijheid?: Politieke Cultuur En Staatsvorming in Friesland, 1600-1640* (Hilversum: Verloren, 2012).

⁶⁴ Ufkes, "De Kerstvloed Van 1717: Oorzaken En Gevolgen Van Een Natuurramp," 30.

⁶⁵ *Ibid.*, 30. This acknowledgement of irresponsibility comes from a state resolution from the 7 July 1718. *Resolutie* (7 July) 1718. *Staten van Stad en Lande*, 1594-1798. 1. 31. Groninger Archieven.

Flooding was described here as an environmental risk, not divine judgment, and therefore subject to human control and responsibility. Perhaps it was this recognition that finally prompted action even if it was largely at the expense of *Ommelanders*.

The Christmas Flood forced the province to re-evaluate dike responsibilities and unearth examples found in the recent memory and legal history of Groninger flooding. Using malleable precedents, both the *Ommelanden* and *Stad Groningen* used the past to bolster their claims. The contest over post-flood institutional responsibility had little use for the language of innovation, despite their goals. The resulting institutional changes fit within a gradualist trajectory of dike centralization better able to deal with long-term environmental developments.

Dike Traditions and Technocratic Solutions

The evolution of dike technology ran in a similar trajectory to that of its management. From their origins as localized protection, Groningers increasingly recognized them as communally valuable. As dikes and water management became larger, more interconnected and complex, they underwent institutional and technological change. The Christmas Flood damaged or destroyed much of Groningen's sea defense infrastructure. Just as the Christmas Flood offered the administrators of *Stad Groningen* and the *Ommelanden* a chance to refashion traditional understandings of dike responsibilities, it presented dike engineers a similar opportunity. As with changes in management, proposals to adapt dike engineering also contended with significant skepticism and outright rejection. Popular appreciation of dike building vacillated between dutiful (and optimistic) maintenance intended to guard against periodic flooding, and a more pessimistic acceptance of the inevitable large floods. Both conflicted with new ideas born out of increasingly professionalized dike engineering that posited the possibility of further control of even the largest floods. The Christmas Flood highlights the cultural and institutional

impediments to technological innovation as well as the importance of history and memory, even for actors advocating a break with the past.

The importance of dikes in the province is both practically apparent and culturally significant. Dikes guarded the coast, gave order and rigidity to a dynamic (even chaotic) landscape, and represented the best and worst of Dutch industry and institutional oversight. When the dikes held, they represented diligence, ingenuity, and a providential association between God and the Netherlands. When dikes failed, as they did in spectacular fashion following the Christmas Flood of 1717, these maxims were turned on their heads.

This vacillating optimism and pessimism regarding the efficacy of dikes reflected the tidal nature of Groningen's coastal geography and history.⁶⁶ The earliest incarnations of Groninger dikes were seasonally useful, being frequently overtopped during the winter.⁶⁷ Permanent settlement necessitated larger, more enduring alterations to the coastline. Into the eighteenth century, however, there existed no failsafe protection against the highest floods. Many optimistic commentators offered a duty-laden perspective on dike building. "The dike must ever preserve this land, like the rudder to a ship in angry waves."⁶⁸ This portion of a poem by Mennonite minister Johannes Deknatel five years following the flood reveals the cultural importance of dikes.⁶⁹ Dikes stabilized the coast much as a rudder orients a ship, and offered

⁶⁶ It also reflects the conflicted nature of eighteenth-century responses to natural disaster in general, whereby technological optimism met pre-modern worldviews. See: Alessa Johns, "Introduction," in *Dreadful Visitations: Confronting Natural Catastrophe in the Age of Enlightenment*, ed. Alessa Johns (New York: Routledge, 1999), xv.

⁶⁷ Hacquebord and Hempenius, *Groninger Dijken Op Deltahoogte*, 35.

⁶⁸ J. Deknatel, *Klaag En Troost-Dicht over Den Tegenwoordigen Staat Van Oost-Vriesland, Door Zwaare Watervloeden Van Vyf Achter Een Volgende Jaaren in De Uytterste Ellende Gebracht* (Amsterdam: s.n., 1722).

⁶⁹ Written five years following the event, Deknatel's perspective is colored by providential rhetoric but deeply person as well as he was forced to abandon his studies in Amsterdam because the Christmas Flood undermined his

dryness, productivity, and order amidst the chaos of the sea. Dikes were symbolically useful reminders of the historic struggle with the sea as well as evidence of God's providential attention. Clarence Glacken, in his monumental *Traces on the Rhodian Shore*, posits that this Dutch hydraulic engineering may have even influenced the prevailing optimistic interpretation of humanity's control of nature in the seventeenth century.⁷⁰

Dikes were certainly a source of pride and symbols of diligent labor. "The making of new land belongs to God alone," opined Golden Age dike engineer Andries Vierlingh, "for He gives to some people the intelligence and power to do it. It takes love and very much labour, and it is not everybody who can play that game."⁷¹ Even the most self-confident engineers did not attribute their successes entirely to their own skill, however. "I thank God for offering me the strength and power to execute the orders of the [provincial government] with zeal and speed," stated head Groninger dike engineer Thomas van Seeratt in his journal.⁷² It was much more common for engineers to attribute the ultimate success of dikes (or their construction) to God.

When the dikes broke, that optimism was reversed and the same dikes represented failure. Poetically addressing the Dike following the flood of 1717, Deknatel cried "O Dike, you make my soul weep, to see you breaks my heart, at night do you care about my bitter woes, in the day you assault me with grief and sorrow, who shall fill your breaches?"⁷³ Order and productivity were likewise threatened. The "fertile land turned to salted ground" was an oft-

parents' financial means to support him. Jan Pieter de Bie, Jakob Loosjes, and L.A. van Langeraad, *Biographisch Woordenboek Van Protestantsche Godgeleerden in Nederland*, vol. 2 (Utrecht: Kemink & Zoon, 1919), 416.

⁷⁰ Clarence J. Glacken, *Traces on the Rhodian Shore: Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley: University of California Press, 1967), 476.

⁷¹ Ibid.

⁷² Thomas van Seeratt. *Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721*. 1730. Staten van Stad en Land. 1. 818. Groninger Archieven, 26-27.

⁷³ Deknatel, *Klaag En Troost-Dicht*, 6.

repeated biblical allusion to what literally and figuratively occurred following a flood.⁷⁴ Popular compendia of flood events preserved the memory of failure and in Groningen, the most popular were Simon Gabbema's *Dutch Floods, or a precise description of every flood occurring in Holland...*, Ludolf Smids' "*Diluviana*" or *almanac of Dutch floods...*, and later Gerardus Outhof's *History of every major flood, in nearly every part of Europe, from the time of Noah to the present*.⁷⁵ Sermons and poetry captured the emotional shock of failure and *gedenkstenen* (memorial stones) marked the highest water level reached during a flood or the number of casualties. The dikes themselves were daily, visual reminders of the risk-prone condition of Groninger society.

The lessons of these disasters, kept alive in the cultural production of Groningen, ran contrary to some of the more positive assessments of dike engineers like Vierlingh. One common assertion was that the full force of a large storm was impossible to withstand. "No dike, however strong, remained standing," A.E. Crous stated in his *Historis-Verhaal*, "but was quickly washed across the country by the flood."⁷⁶ Adriaan Spinniker was particularly fatalistic in his poem. "No industry or effort may here avail the angry waves," he stated, "the strongest dikes were penetrated, the spring flood empties without limit, and an innumerable number of villages are

⁷⁴ Harkenroht, *Oostfriesche Watersnood in Eene Kerkreeden.*, 1. This is taken from Psalm 107:33-34.

⁷⁵ Simon Abbes Gabbema, *Nederlandse Watervloeden, of Naukeurige Beschrijvinge Van Alle Watervloeden Voorgevallen in Holland ... En De Naaburige Landen* (Gouda: Lucas Cloppenburg, 1703); Ludolf Smids, *Diluviana of Daghwysen Der Nederlandsche Waternooden Van Het Jaar 793 Tot Deesen Laatste Van Den 25 November Des Verledene Jaars 1717* (Amsteldam: Hendrik vande Gaete, 1718); Outhof, *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden*.

⁷⁶ Crous, *Opregt En Nauwkeurig Historis-Verhaal*, 62.

consumed by its fury.”⁷⁷ Little of the optimistic interpretation of dikes is evident in these sources.

This fatalism was not restricted to clergymen. When the *commies provinciaal* (head engineer) of Groningen, Thomas van Seeratt, was charged by the provincial authorities to repair the northern and western portions of Groningen’s sea defenses, Van Seeratt faced fatalistic resistance. His coerced workforce often refused to labor, and according to him, preferred instead to lounge and sleep.⁷⁸ Despite the obvious dangers of leaving large sections of the province unprotected as winter approached, the workers believed that “floods came once every 30 years and nobody could construct dikes against them.”⁷⁹ The aforementioned conflict between the *Stad Groningen* and the *Ommelanden* concerning the responsibility for labor and funds no doubt augmented this fatalist attitude. Workers resistant to what they viewed as a break with the traditional role of the city in dike repair employed rhetoric of civil disobedience to assert control.

Van Seeratt’s perspective was far from pessimistic. Providentialist rhetoric certainly affected his plans when he contended with fatalism in his dike force, but his journal focused primarily on the viability of his new designs. Van Seeratt proposed new dikes much larger than any previously built in Groningen. To gain the support of a skeptical provincial government, he

⁷⁷ Spinniker, *Gods Gerichten Op Aarde, Vertoond in Den Schrikkelyken Storm En Hoogen Watervloed, Op Den 25 En 25sten Van Wintermaand in 'T 1717de Jaar Voorgevallen* (Groningen: Jurjen Spandaw, 1718), 8-12. A. van Deursen argues that floods as well as plagues and other natural disasters were accepted with resignation. The helplessness of the Dutch in the face of God’s wrath, he argues, was tempered by an understanding of the ultimate cause of disasters: “sin had aroused God’s wrath, which poured out in plague, war, dearth, and flood.” A.Th. van Deursen, *Plain Lives in a Golden Age: Popular Culture, Religion and Society in Seventeenth-Century Holland*, trans. Maarten Ultee (Cambridge: Cambridge University Press, 1991), 239.

⁷⁸ J. Zijlma. *Thomas Seeratt: Geschetst in Zijne Verhouding Tot Het Provinciaal Dijkwezen*. Bibliotheek RAG. 4712. Groninger Archieven, 17.

⁷⁹ Van Seeratt, "Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721," 67.

employed an optimistic rhetoric that posited a technocratic solution to flooding using past designs as contrast. Van Seeratt's journal, sketches, and notes are explanatory as well as argumentative. His plans outlined the dimensions of dikes as well as their rationale. This was necessary because his work was subject to review and criticism by his superiors in the provincial government. Even prior to the flood 1716, after he offered recommendations for dike improvements, provincial authorities questioned his expertise.⁸⁰

In order to solidify his expert position and quiet his critics, Van Seeratt cited his familiarity with the sea, having been a sea captain for over twenty years, as well as his grounding in mathematics. "Most of my life has been spent at sea," he argued, and "whenever a person, through God's grace, has a reasonable understanding and skill in mathematics" his authority should be recognized.⁸¹ Van Seeratt tapped into a growing trend in dike management in Groningen and throughout the Netherlands. Since the seventeenth century, water management institutions increasingly sought experts trained in statistics, geometry, as well as for their drafting skills.⁸² Additionally, Van Seeratt's journal contains sketches of past dike designs to visualize the benefits of his approach to dike building. One example is a depiction of a *kisthoofd* (breakwater) extending perpendicular from the dike. This older design, (Figure 3.10) Van Seeratt

⁸⁰ This may be because the position of *commies provinciaal*, despite its seemingly prerequisite technical expertise, had been occupied by bureaucrats rather than engineers or craftsmen. State surveyors and engineers largely compensated for this gap in expertise. Gea van Essen, *Bouwheer En Bouwmeester: Bouwkunst in Groningen, Stad En Lande (1594-1795)* (Assen: Koninklijke Van Gorcum, 2010), 52.

⁸¹ Van Seeratt, "Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721," 8.

⁸² While it focuses on the *Rijnland* waterboard in Holland, Zeischka excellently outlines the main trends in technological knowledge and implementation in this era. Siger Zeischka, *Minerva in De Polder: Waterstaat En Techniek in Het Hoogheemraadschap Van Rijnland 1500-1865* (Hilversum: Uitgeverij Verloren, 2008).

believed, “traps the stream flow and washes the ground away.”⁸³ In Van Seeratt’s new proposal (Figure 3.11), the *kisthoofd* extended at an angle, causing no whirlpool action and even accreting new soil for reclamation.⁸⁴ This dual benefit of both protecting and increasing land was savvy as it and must have appealed to the economic sensibilities of the provincial administrators.

⁸³ van Seeratt, "Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721," 262. This type of *kistwerk* construction consisted of driving two rows of large wooden poles in the ground (*palen*) and then filling them with rubble. This type of design originated in Zeeland and spread northward through Holland in the early sixteenth century. P.J.E.M. van Dam, *Vissen in Veenmeren : De Sluisvisserij Op Aal Tussen Haarlem En Amsterdam En De Ecologische Transformatie in Rijnland 1440-1530* (Hilversum: Uitgeverij Verloren, 1998), 259.

⁸⁴ *Ibid.*, 263.

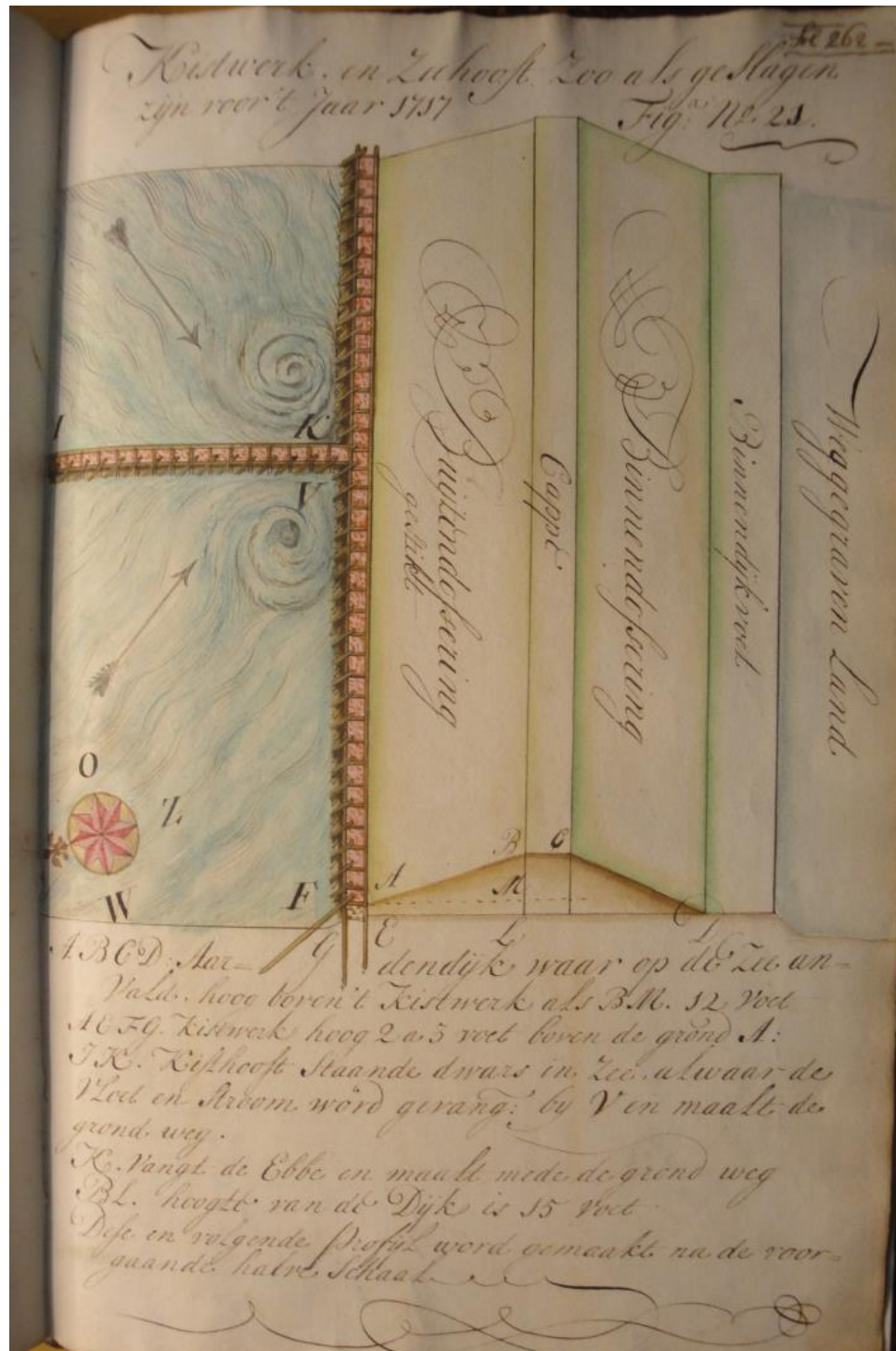


Figure 3.10 Diagram of *kisthoofd*. In his 1730 journal, Thomas van Seeratt included multiple designs for breakwaters (called *kisthoofden* or *zeehoofden*). These wood and stone wave-breakers (shown at the left of the image) extended at a perpendicular angle away from dikes into the North Sea. In this drawing, Van Seeratt depicts the *kisthoofd* as it appeared prior to the flood of 1717. Van Seeratt argued that this design increased erosion of the dike because it trapped water (which he depicted as whirlpools). Groninger Archieven. “Journaal van de Commies Provinciaal Thomas van Seeratt betref de dijken over de jaren 1716-1721.” 1.818 (1730), 262.



Figure 3.11 Alternate design of *kisthoofd*. In contrast to the perpendicular *kisthoofden*, Van Seeratt designed an alternative breakwater that extended at a 30-degree angle away from the dike body. Van Seeratt argued that this design prevented erosion because it did not trap waves propelled by dangerous northwesterly winds (depicted as arrows in this image). The “still water” behind the *kisthoofd* promoted reclamation. Van Seeratt later presented copies of this journal with images to authorities in the Ommelanden and Stad Groningen in order to preserve his contribution for posterity. The designs in his journal reinforced the reputation he cultivated as an expert dike engineer. Groninger Archieven. “Journaal van de Commies Provinciaal Thomas van Seeratt betref de dijken over de jaren 1716-1721.” 1.818 (1730), 263.

Van Seeratt also proposed enlargement of dike bodies, citing historic design failures such as small size and steep slopes as contrary to new ideas about proper dike design. Gently sloping dike bodies absorbed the impact of waves and dispersed their energy over a wider surface than steeply sloped dikes. These diagrams included geometric appraisals of these advantages and a geographic awareness of past weaknesses. He noted the inferior quality of the marine soils supporting many of the older dikes. The “sandy ground” supporting the sea dike to the north of Leens was responsible for its complete destruction during the flood. Even the mixture of sand and clay in other sections was problematic.⁸⁵ In an effort to save money, reclaim new land, and speed the process of building new dikes, Seeratt also enlarged and improved existing *slaperdijken* (smaller dikes that prevented summer, tidal flooding) built in 1637 and 1655, promoting them to sea dike status.⁸⁶ (Figure 3.12)

⁸⁵ Ibid., 254.

⁸⁶ G.P. van de Ven, *Leefbaar Laagland: Geschiedenis Van De Waterbeheersing En Landaanwinning in Nederland*, International Commission on Irrigation and Drainage. Nederlands Nationaal Comité (Utrecht: Uitgeverij Matrijs, 2003), 145.

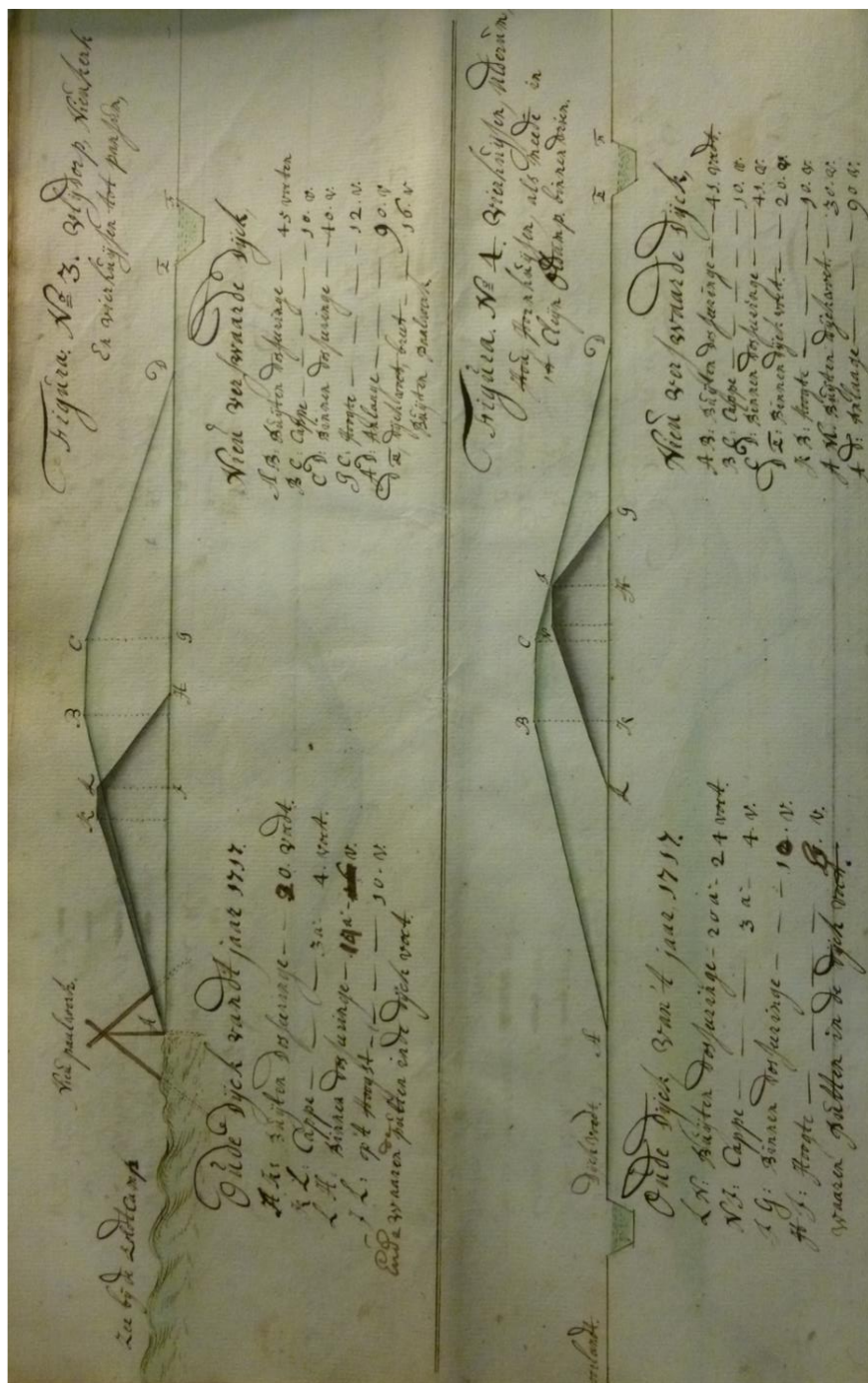


Figure 3.12 Improved dike designs. This drawing taken from Thomas van Seeratt's report to the Staten der Ommelanden in 1721 visualizes his rhetoric of improvement by contrasting innovative dike designs with failures from the past. Two images of dikes are superimposed, the smaller of which depicts the "old dike from the year 1717" near the town of Zoutkamp. The larger "new strengthened" dike highlights many of the changes advocated by Van Seeratt including increased height and width of the dike body, the addition of paalwerken (wooden wave-breaking palisades that protected the seaward face of dikes), and decreased slope of the dike sides. From Groninger Archieven. (*Notes on all of the dikes, post and pileworks under the supervision of the Province of Groningen and the Ommelanden (Notitie van alle de dijcken, post- en paalwerken, incumberende de Provintie van Stadt Groningen en om Landen)*, 2.1086, 1721.

As opposed to the memorializing tendencies of providentialism and the valorization of tradition and precedent in institutional dialogues, Van Seeratt used the past more subtly. His was a dialogue of innovation.⁸⁷ He nonetheless actively defined and claimed the past as contrast to his own plans. Innovation requires a historic baseline against which improvement can be measured. The flood of 1717 was an opportunity for Van Seeratt to define that baseline and further his technocratic ambitions at the expense of older traditions of water management. Groningen's dike history, as offered in Van Seeratt's sketches, was his best argument for change.

Van Seeratt's interest in claiming the past was more profound than simply offering a rubric against which his designs could be evaluated, however. He was just as interested in capturing a place for himself in cultural memory. Van Seeratt's journal was his legacy and his strongest statement for posterity. Just as with institutional and religious documents, it is an attempt to harness the power of memory. On 1 January 1719, another strong storm hit Groningen, overtopping dikes. Those completed according to Van Seeratt's specifications held; those that did not were washed away. Seeratt interpreted this as divine validation of his ideas. "God desired this storm," he proudly noted, "to test the best of the country...and opened the eyes of all those who are sincere...whereby my own credit was not slightly increased."⁸⁸ His journal, written in 1730 and distributed at the end of his career, cemented his reputation by laying claim

⁸⁷ Rhetoric, here, should be underlined. There is room to question how much actual change Seeratt advocated. Seeratt's dikes were certainly larger, though his rhetoric is in keeping with the ongoing (somewhat disingenuous) efforts of engineers to privilege their own techniques at the expense of older techniques of dike building. It was a popular trope amongst eighteenth century dike engineers to target the supposedly medieval practice of building dikes with too steep a slope. See: Franz Mauelshagen, "Disaster and Political Culture in Germany since 1500," in *Natural Disaster, Cultural Responses: Case Studies toward a Global Environmental History* ed. Christof Mauch and Christian Pfister (New York: Lexington Books, 2009), 52; Hans Joachim Kühn, *Die Anfänge Des Deichbaus in Schleswig-Holstein* (Heide: Boyens & Company, 1992), 54.

⁸⁸ Van Seeratt, "Journaal Van De Commies Provinciaal Thomas Van Seeratt Betref De Dijken over De Jaren 1716-1721," 86-87.

to the past.⁸⁹ This final statement of vindication was self-serving, though also a fitting reminder of many of the historical lessons of the Christmas Flood of 1717. Firstly, it emphasizes the interdependency of providentialism with the business of governing and constructing dikes. Van Seeratt was not fatalistic about massive flooding and he was confident in his designs, but this did not diminish divine causation. Indeed, in this case, it reinforced his technocratic ambitions.

Van Seeratt's statement is also a reminder that each new storm event was a potential theater for the reevaluation of flood causation, disaster management, and dike engineering. These changes were not necessarily progressive. Only two years after the Christmas Flood, innovation was no longer Van Seeratt's emphasis, but rather justification of his (now implemented) dike designs. Instead of naturalistic explanations, this storm was sent by God. The event focus highlights contingent factors such as personal ambition that fade in the longer view of flooding.

Conversely, his claim also highlights the benefit of longer term evaluations of both flood interpretation and changes to the physical environment. Van Seeratt viewed the 1719 flood event as an opportunity, but this opportunity was only available because centuries of environmental change outpaced management and left dikes in disrepair. Additionally, Van Seeratt's choice to document his role was more than simply one actor re-fashioning history, but indicative of a dominant theme across the multiple dialogues employed in the aftermath of the Christmas Flood.

⁸⁹ His success is evidenced in the many references to his personal role in the flood in folk almanacs over the years. See: *Groninger Volksalmanak Voor Het Schrikkeljaar 1848*, vol. 12 (Groningen: A. Oomkens, J. Zoon, 1848); G. Zijlma, "De Kerstvloed Van 1717," in *Groningsche Volksalmanak Voor Het Jaar 1918*, ed. J.G.C. Joosting and H.A. Poelman (Groningen: Erven B. van der Kamp, 1917). Perhaps the best indication, however, was the Groningen water authorities' decision to name a water board after him. The Thomas van Seeratt Waterschap (1919-1974) is now subsumed within the waterschap Noorderzijlvest. K.A.M. Engbers and A.L. Hempenius, *Verzamelinventaris Van De Archieven Van De 'Kust'waterschappen Inliggend in Het Waterschap Hunsingo En Het Waterschap Reitdiep (1805) 1856-1990 (1994)* (Groningen: Laurentius Archief & Geschiedenis, 2011), 159.

These attempts by contemporaries to claim the past underlines the appeal of employing long term processes like cultural memory as historical tools.

Finally, Van Seeratt's self-described success belies the power of his rhetoric of innovation. The novelty of his designs was exceptional, but also dependent upon a context of institutional and providential dialogues that hearkened to the past. Van Seeratt's dikes rested upon a financial and moral foundation offered by the negotiation of conflicts within these dialogues. Each was couched in memory, justified by the use of the past, and held implications that affected flood response, both in the short- and long-term. In the case of the Christmas Flood, claiming the past was as critical a response as offering an improved future.

Comparing the Christmas Flood to the First Cattle Plague Epidemic

On its surface, a flood and a panzootic do not share much in common. Coastal dikes and quarantines seem to have as little to do with one another as storm surges and infectious diseases. Disaster histories accommodate this assumption and largely segregate nature-induced disasters according to the physical hazard that produces them.⁹⁰ Floods, according to this rubric, are best compared to other floods, preferably of a similar type and during a roughly similar time-period. This approach certainly has merits, but at its core, it remains an attempt to eliminate the physical environment as a variable in favor of cultural or temporal explanations of historical change. Not

⁹⁰ Over the last several years, this trend has been challenged by several scholars and several significant edited volumes which seek to compile histories of the international response to multiple types of disasters. This is as significant in its international comparative approach as it is in its breakdown of the typology of nature-induced disasters. Marijke Gijswijt-Hofstra and Florike Egmond, eds., *Of Bidden Helpt? Tegenslag En Cultuur in Europa Circa 1500-2000* (Amsterdam: Amsterdam University Press, 1997). Manfred Jakubowski-Tiessen and Harmut Lehmann, eds., *Um Himmels Willen: Religion in Katastrophenzeiten* (Göttingen: Vandenhoeck & Ruprecht, 2003). Christof Mauch and Christian Pfister, eds., *Natural Disasters, Cultural Responses : Case Studies toward a Global Environmental History* (Lanham, MD: Lexington Books, 2009). Alessa Johns, ed. *Dreadful Visitations: Confronting Natural Catastrophe in the Age of Enlightenment* (New York: Routledge, 1999).

only does this approach sometimes ignore the fact that physical hazards (while ostensibly of the same “type”) retain powerful differences, but also glosses over the cultural connections people sought between what are today considered unrelated disasters. These connections were important because they partly determined the manner in which people interpreted and responded to disasters.

It is therefore not surprising that response to nature-induced disasters in the eighteenth-century Netherlands adhered to similar patterns of interpretation and modes of response. As a result, the responses to the Christmas Flood and the first cattle plague epidemic fall into easily transferable categories such as providentialism, the institutional regulation of disaster, and the attempt to manipulate or wield a secular understanding of the natural environment to mitigate or prevent disaster. Commentators employed cultural memory and history in the wake of both disasters as rhetorical tools that offered legitimacy for their interpretations. These categories were not mutually exclusive. Indeed, as has been shown in these two chapters, they were oftentimes mutually-reinforcing. Providentialism had the most clearly identifiable commonalities.

Within these broad common themes, it is useful to examine contrasting elements as well. For instance, why did water management in the wake of the Christmas Flood create or unearth institutional conflict on a scale not seen as a result of the cattle plague? Disasters are often considered catalytic events that either unearth buried tensions or bridge those differences by

forcing communities into a situation of mutual dependency.⁹¹ What is less frequently expressed in disasters studies is that communities can express these conditions simultaneously. Institutional reactions to cattle plague and flooding are a case in point.

Water management in the Netherlands had a much longer institutional history and was far more rigidly regulated than animal disease in the Netherlands. The contested nature of flood interpretation and management, as well as the prominent role played by causal storytelling in the wake of the Christmas Flood were partly defined by this difference. In Groningen, for instance, little institutional disagreement developed out of the cattle plague episode because there were no equivalent provincial commissions to *dijkrechten* or history of financial negotiations as was the case with flooding. In contrast, multiple powerful positions following the Christmas Flood vied for the ability to set the post-disaster agenda. This case comparison is a telling demonstration of the fact that institutional mechanisms constructed to manage disasters may sometimes exacerbate them.

Conflict that arose as a result of the cattle plague stemmed primarily from individual rejection of provincial decrees for financial reasons and do not seem to be related to the broader, historically grounded conflict between *Stad Groningen* and the *Ommelanden*. Indeed, this situation even appeared to persist in the immediate aftermath of the Christmas Flood. The representatives of the *Ommelanden* quickly expressed their thanks to the city for the “good care,

⁹¹ Jürg Helbling, "Coping with 'Natural' Disasters in Pre-Industrial Societies: Some Comments," *The Medieval History Journal* 10(2006): 429-46. Kenneth Hewitt, *Regions of Risk : A Geographical Introduction to Disasters* (Harlow, Essex: Addison Wesley Longman, 1997).

speed, zealousness, and prompt orders to save the *Ommelander* victims.”⁹² Tensions only emerged when conflicting parties challenged the traditions and legal precedents that undergirded shared water management responsibilities. This conflict required an extensive legal and regulatory system, enshrined in precedent and historic conflict—conditions that did not exist in Groningen in the event of cattle plague.

As a final comparison, it is useful to juxtapose Dutch attempts to manipulate the natural environment to mitigate or prevent disaster during these two disasters. In the case of plague, the *Staten van Stad en Lande* employed quarantines and import and export restrictions, essentially managing animal movement. They also actively sought remedies for the cattle plague itself, gathering and publishing medicines and treatments. Provincial administrators grounded these responses in an early modern medical understanding of diseased spaces and bodies. Similarly, the province managed water using primarily time-tested means of physically reinforcing dike defenses. By way of contrast, there was little indication that the state or individuals used the cattle plague to advance novel medical responses. Whereas the Christmas Flood prompted some change despite (or perhaps because of) a respect and dependency on the past, Dutch attempts to manage disease yielded few new techniques or treatments. The key difference was Thomas van Seeratt’s technocratic strategy that demanded improvement of dike defenses.

During episodes of flooding and cattle plague, Dutch institutions and individuals drew on their long histories of dealing with these problems to enact solutions. This lent significant continuity to the Dutch responses in the long term. History, tradition, and memory had great

⁹² “hebben de Heeren van Ommelanden in specie de Heeren van Stad mede ten hoogsten bedankt voor de goede Sorge, Vlyt, en iyver en prompte ordres die deselve tot redding van de noodlydende Ingesetenen der Ommelanden” “Resolutie (31 December, 1717).”

practical as well as rhetorical power in the aftermath of catastrophe. Novelty and innovation, while apparent, still occupied a contested space with traditional means of interpreting and responding to disasters. The arrival of a completely new disaster in the 1730s, however, significantly altered the balance between these elements.

Chapter 4. A Plague from the Sea: Shipworms, Novelty, and Dike Innovation, 1730-1735

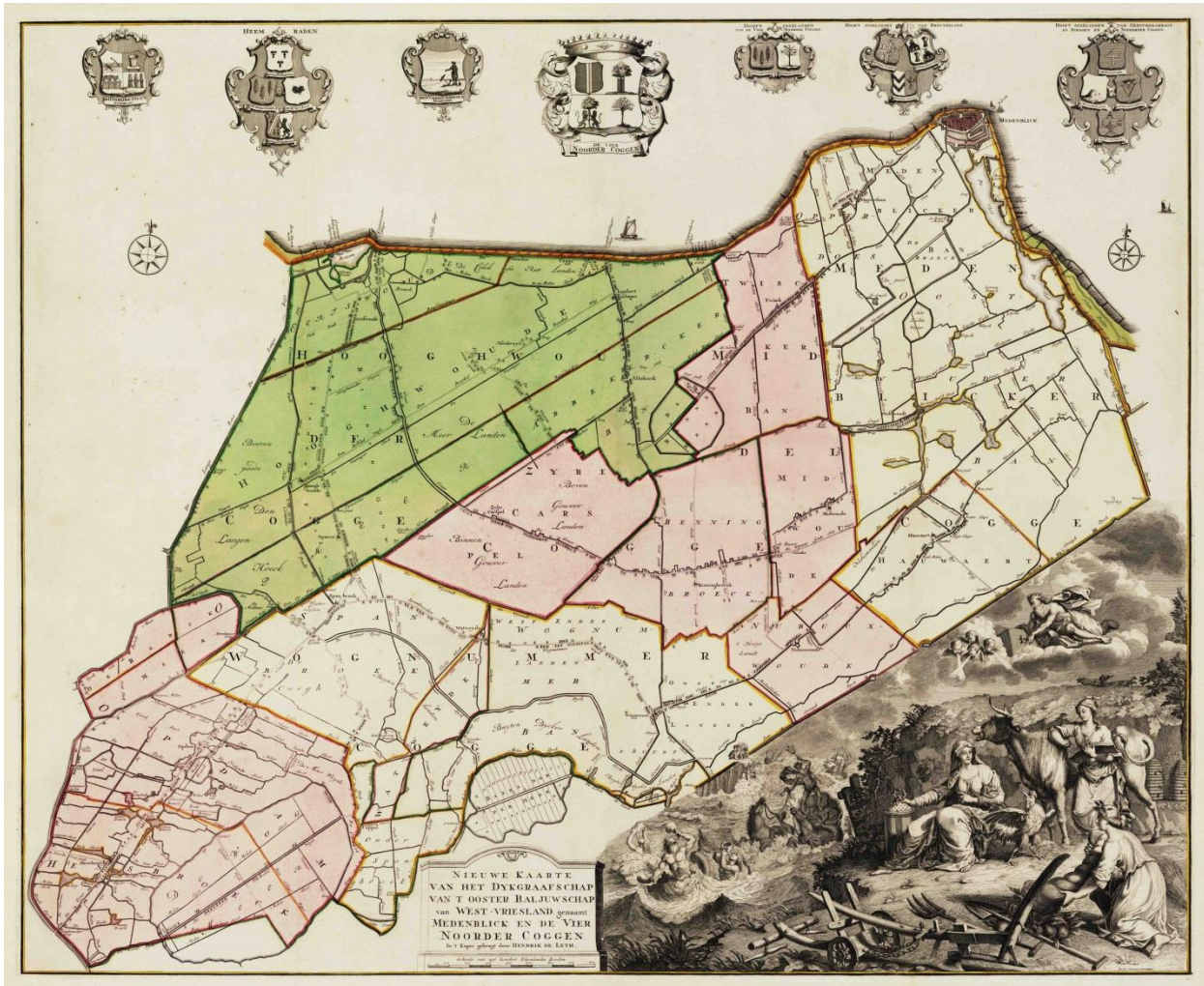


Figure 4.1 This commemorative map highlights the water management districts of the water board of the Vier Noorder Coggen. These “four northern polders” made up one coastal section of the region West Friesland in Holland. Shipworms infected the sea dikes on the northern border area indicated by the thicker black line. Pieter Straat, *New Map of the Dike Reeve District of the Eastern Bailiffship of West Friesland, named Medenblick and the Vier Noorder Coggen* (*Nieuwe kaarte van het dijkgraafschap van 't Ooster Baljuwschap van West-Vriesland, genaamt Medenblick en de Vier Noorder Coggen*) 1730. TU Delft Library, Trésorcollectie.

When the water board of the *Vier Noorder Coggen* in northern Holland commissioned a map of their territory in 1730, they could not have realized that the achievements in water management that it memorialized were already obsolete. (Figure 4.1) That same year following a minor storm, dike inspectors far to the south in the province of Zeeland discovered a little-known marine mollusk that bored into the wooden barriers that protected some of the sea dikes along the coastline. By 1731, inspectors in the *Vier Noorder Coggen* found similar infestations in their own dikes. These “worms,” as the Dutch referred to them, burrowed into the wooden piles, palisades, and frameworks that protected the seaward face of coastal dikes across the North Sea and Zuiderzee coastlines. They created a honeycomb of passages that weakened wooden structures and caused them to snap during storms. Without these barriers, the earthen portion of dikes was exposed to the erosive force of storm surges. Less than a year after the publication of the map, a dike inspection in the *Vier Noorder Coggen* concluded that large portions of its coastal dikes needed rebuilding, even redesign, in an effort to combat this strange new plague. This local effort was one part of a general reevaluation and reconstruction of dikes throughout the coastal Netherlands in the 1730s.

The dominant narrative of the shipworm plague in Dutch historiography privileges its revolutionary character.¹ Scholars interpret the shipworm disaster as a catalyst for rapid change—a pivot in the history of Dutch dike engineering. Accounts of novel environmental challenges leading to innovation and eventual adaptation are well-worn tropes in the history of

¹ See, for instance, G.P. van de Ven, *Leefbaar Laagland: Geschiedenis Van De Waterbeheersing En Landaanwinning in Nederland*, International Commission on Irrigation and Drainage. Nederlands Nationaal Comité (Utrecht: Uitgeverij Matrijs, 2003)., 144-145. This book is also available in English: *Man-Made Lowlands: History of Water Management and Land Reclamation in the Netherlands* (Utrecht: Matrijs, 2004).

Dutch dike engineering and most histories reference this period as a case study in Dutch ingenuity and engineered solutions. The strength of this narrative relies on its compelling outcome. After two years of anxious and reactionary public debate, the *Staten van Holland* authorized a capital-intensive, technocratic solution proposed by two public officials in a region of Holland called West Friesland. Two water board authorities named Pieter Straat and Pieter van der Deure advocated a fundamental restructuring of Dutch dikes by removing wooden elements from the water, broadening and enlarging dikes bodies, and covering their slopes with stone.² This basic design was broadly implemented and is still employed today.

The story of Dutch response was far more contested than this narrative allows, however, and had implications that extended beyond dike engineering. It took two years after the initial discovery of the worms for Holland to implement a plan in West Friesland and even longer for other regions to follow suit. Despite their rhetoric of novelty, Straat and Van der Deure drew on existing precedent for their designs; both actualized in the distant past and theorized more recently. Many of the same considerations that defined disaster response in the wake of the other disasters of the early eighteenth century shaped their designs including the first cattle plague epidemic and the Christmas Flood of 1717.

Just as with these earlier disasters, multiple contested viewpoints vied for a role in the adaptive dialogue to the shipworm threat. Some commentators advocated drastic revisions to dike designs or to understandings of the environmental threat, while others opted for more

² P. Straat and van der Deure, *Ontwerp Tot Een Minst Kostbaare Zeekerste En Schielykste Herstelling Van De Zorgelyke Toestand Der Westfriesche Zeedyken... Met Een Nader Ontwerp Hoe Men De Dyken Daar De Grootste Dieptens Zyn Op De Zekerste, Minst Kostbaarste En Schielykste Wyze Kan Herstellen... Door Pieter Straat En Pieter Van Der Deure* (Amsterdam: J. Oosterwyk, 1733).

conservative approaches. Ultimately, the novelty of this disaster threat pushed contemporaries toward more drastic change. This chapter demonstrates that each of these perspectives played an important role in determining Dutch response.

As a source, the map of the *Vier Noorder Coggen* is both institutional and a narrative source. It is useful not only because it reveals the state of coastal defense prior to one of the largest and most coordinated restructuring of dikes in Dutch history, but also because of what it reveals about the process of change and the persistence of traditional modes of understanding environmental threats. The majority of the map (Figure 4.2) portrays the West Frisian landscape as a collection of linearly organized regions of drainage and privileges the socio-economic interests of institutional management. It highlights regions of water management, subdivided by waterways like drainage ditches. It also depicts the sea dike (far right) with its numbered sections of dikes that dike authorities used in their account books and dike reports. Historically, the water board taxed landowners with property abutting dikes, but this relationship had been slowly changing as localities struggled to maintain increasingly large and expensive dike systems.³ This map visualized, therefore, a moment of time in an evolving political and financial relationship between landowners, water managers, and the Province of Holland. Ecological and environmental challenges, including nature-induced disasters such as flooding and shipworms, accelerated this change by necessitating new and oftentimes larger capital investments.

³ J. de Bruin and D. Aten, *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland: De Watersnood Van 1675-1676* (Purmerend: Vrienden van de Hondsbossche, Kring voor Noord-Hollandse waterstaatsgeschiedenis, 2004).

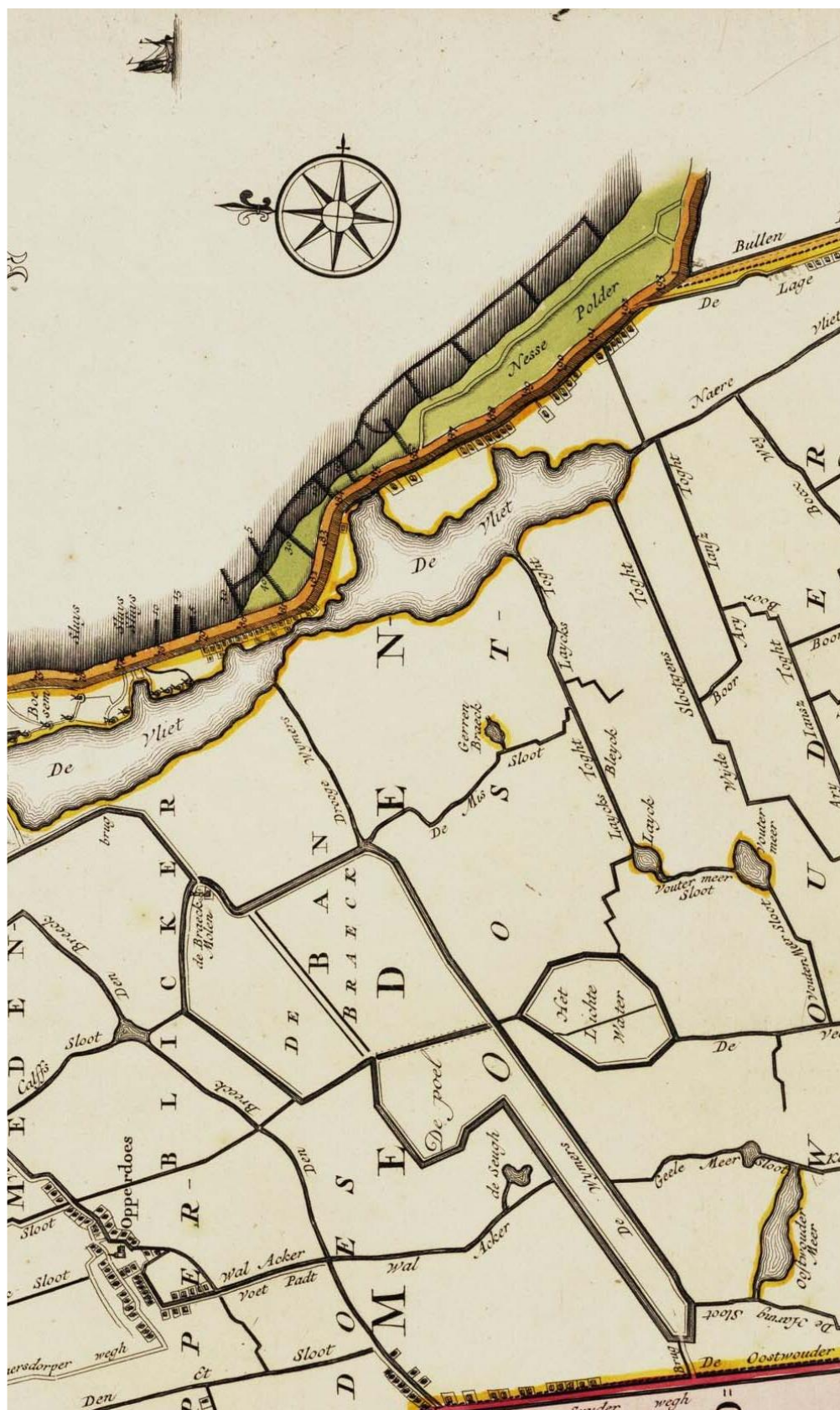


Figure 4.2 Detail from Pieter Straat, *New Map of the Dike Reeve District of the Eastern Bailiffship of West Friesland, named Medenblick and the Vier Noorder Coggen*, 1730. This detail of Straat's map highlights the largely rectilinear format of water management in West Friesland. The landscape is divided by drainage ditches and waterways, with the far right lines indicating the sea dikes, its numbered subdivisions, houses, windmills, sluice gates, and wooden wave breakers extending out into the sea. TU Delft Library, Trésorcollectie.

The engraving positioned at the lower right of this map is a rich source of narrative information that hints at the prevailing technocratic perspective of dike managers. (Figure 4.3) Images of beehives (symbol of industriousness), agricultural implements, and female personifications of productivity and wisdom offer an optimistic vision of Dutch environmental mastery and diligence. These values were necessary to protect Dutch prosperity, visualized here as the Dutch cow and the cornucopia of abundance. Classical figures representing the power of the elements temper this optimistic vision, however. The image depicts the destructive, providential forces of wind and water (here personified as Aeolos and Neptune), both omnipresent threats to the productivity of the Netherlands. The juxtaposition of technological optimism and cultural anxiety in this engraving, as well as its prominent positioning relative to the functional portion of the map were useful reminders of what was required to protect Dutch lands and the gravity of what was at stake.

It is easy to position these modes of understanding in a continuum extending through the earlier disasters of the eighteenth century, but the lived experience of the shipworm epidemic was also one of cultural, environmental, and technological novelty. Not only was the biological threat itself new, but Dutch response was also unique in terms of scale, type of response, and the degree of anxiety it inspired. This chapter again places the environmental and cultural dimensions of the Dutch decision-making process in the wake of disaster front and center, situating the shipworm episode in the context of an era of disasters and Dutch decline. It also poses a number of questions regarding the cultural, institutional, and technological responses to the shipworm epidemic.

First, where did the shipworms come from and why did they manifest in such an explosive fashion? Historians rarely discuss the “why” of this question although it was a subject of considerable interest for contemporaries. Natural historians, religious leaders, and laypeople debated the origin and meaning of the shipworm threat because they offered opportunities to capture prestige, moral or technocratic authority, or explain patterns of larger environmental and social issues. These causal stories grounded larger narratives of decline and explicitly informed decision-making pathways directly related to technological adaptation. Decadal temperature, precipitation, and salinity changes were also significant and underdeveloped dimensions of the rise and decline of shipworm populations.

Secondly, how can we characterize the Dutch response? Although there was much continuity with previous disasters, the reaction to the shipworm epidemic was equally defined by its uniqueness. Perhaps the most striking example is that, in this culture of risk, the *threat* of disaster in this case instigated far more technological and cultural response than the largest actual floods of the early modern era. Shipworm response consisted of a portfolio of potential remedies,

some tied to preexisting flood dialogues, others challenged by the novelty of the shipworm threat. Pieter Straat and Pieter van der Deure effectively engaged multiple dimensions of this dialogue in their successful design.

Thirdly, why was the response to the shipworm epidemic so reactionary? As seen in previous chapters, contemporaries often drew on deep historical experience with catastrophes, pragmatic traditions of management, legal precedent, and on the cultural memory of proper response. The shipworm epidemic challenged this approach. The novelty of the threat precluded any easy solutions because the Dutch could not draw on history or cultural memory as a source of action. Contemporaries, however, linked this strange, new disaster to the past by incorporating it into a longer series of ongoing disasters. Just as with previous disasters of the eighteenth century, the economic, environmental, and theological dimensions of this period of disaster shaped Dutch response and contributed to the unique interpretation of the shipworm problem.

Background: The (re)discovery of shipworms

The North Sea storm that signaled the beginning of the shipworm episode was in no way extraordinary. Hitting Zeeland in the late fall of 1730, the relatively few records of its existence do not detail significant damage; it caused no major dike breaches, and little to no loss of life or property. The section of the island of Walcheren that was hardest hit, called the *Westkappelse Zeedijk*, had experienced far worse storm events since its construction in the early fifteenth century.⁴ Little if any land fronted large sections of the sea dike, so the Zeelanders constructed elaborate wave breakers and cushions to shield its earthen body. They attached woven mats to

⁴ K. Baart, *Westkapelle, Hare Bevolking, Westkapelsche Dijk ... Met Twee Kaarten* (1889).

the dike consisting of layers of straw, seaweed, and brushwood to absorb wave energy. They arranged large oak piles in parallel rows in front of these mats and filled them in with brushwood and stone to break the force of the waves. These *staketwerken* stood on the slope of the dike or ran perpendicular to the shore to reduce the erosive force of onrushing water. This combination of *staketwerken*, the seaweed mat (*krammatten*), and brushwood (*rijsbeslag*) protected the dike's sand and clay body.⁵ These constructions were very expensive, but they could ordinarily withstand the force of minor storms.

The "small storm wind" in 1730 had much larger implications than many of the more serious flood events in Dutch history, however. On 23 November, the upper commissioner Eudaldus Reynvaan reported to the local governing council (*Staten en Brede Geërfden van Walcheren*) that the storm had shattered several of the oaken piles protecting the dikes. Piles had limited lifespans, but this was surprising because they had been recently installed and were broken in the middle, not at the base. During the winter, sea ice could shatter piles or loosen the *staketwerken*, but this was unlikely the cause of damage because a warm spell had descended upon the Netherlands the previous winter and had remained through the fall of 1730.⁶ "The reason," according to Reynvaan, was that "the piles are full of worms."⁷ Fourteen days later, another small storm destroyed twenty-two of the fifty-one new piles and commissions from other parts of the island began to note their own worm infestations.⁸ Upon further inspection, it

⁵ Leo Hollestelle, "De Zorg Voor De Zeewering Van Walcheren Ten Tijde Van De Republiek, 1574-1795," in *Duizend Jaar Walcheren: Over Gelanden, Heren En Geschoot, over Binnen- En Buiten Beheer*, ed. A. Beenhakker (Middelburg: Koninklijk Zeeuwsch Genoots, 1996), 106.

⁶ Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 573-576.

⁷ Hollestelle, "De Zorg Voor De Zeewering Van Walcheren Ten Tijde Van De Republiek, 1574-1795," 120.

⁸ *Ibid.*, 120.

appeared that worms had spread to “most of the piles and brushwood mats around the island.”⁹ By December, the clerk of the Walcheren council was already speaking of the shipworm epidemic as a disaster. “It can not be seen as anything,” he stated, other than an event that is of “the utmost consequence, if not total ruin of the island.”¹⁰ News of this alarming development in Zeeland spread to other parts of the Netherlands and abroad thanks to reports in Dutch newspapers, and by the fall of 1731, dike inspectors in the provinces of Holland and Friesland found evidence of worm infestation as well. This was troubling to the Dutch because of their long, tragic history of flood disasters resulting from storm surges as well as from the unknown character of the assailant.

⁹ "Bericht Wegens De Plaage Der Wormen in Het Paalwerk Der Dykagien Van Holland En Zeeland," *Europische Mercurius* 1732, 297.

¹⁰ "De Zorg Voor De Zeewering Van Walcheren Ten Tijde Van De Republiek, 1574-1795," 120.

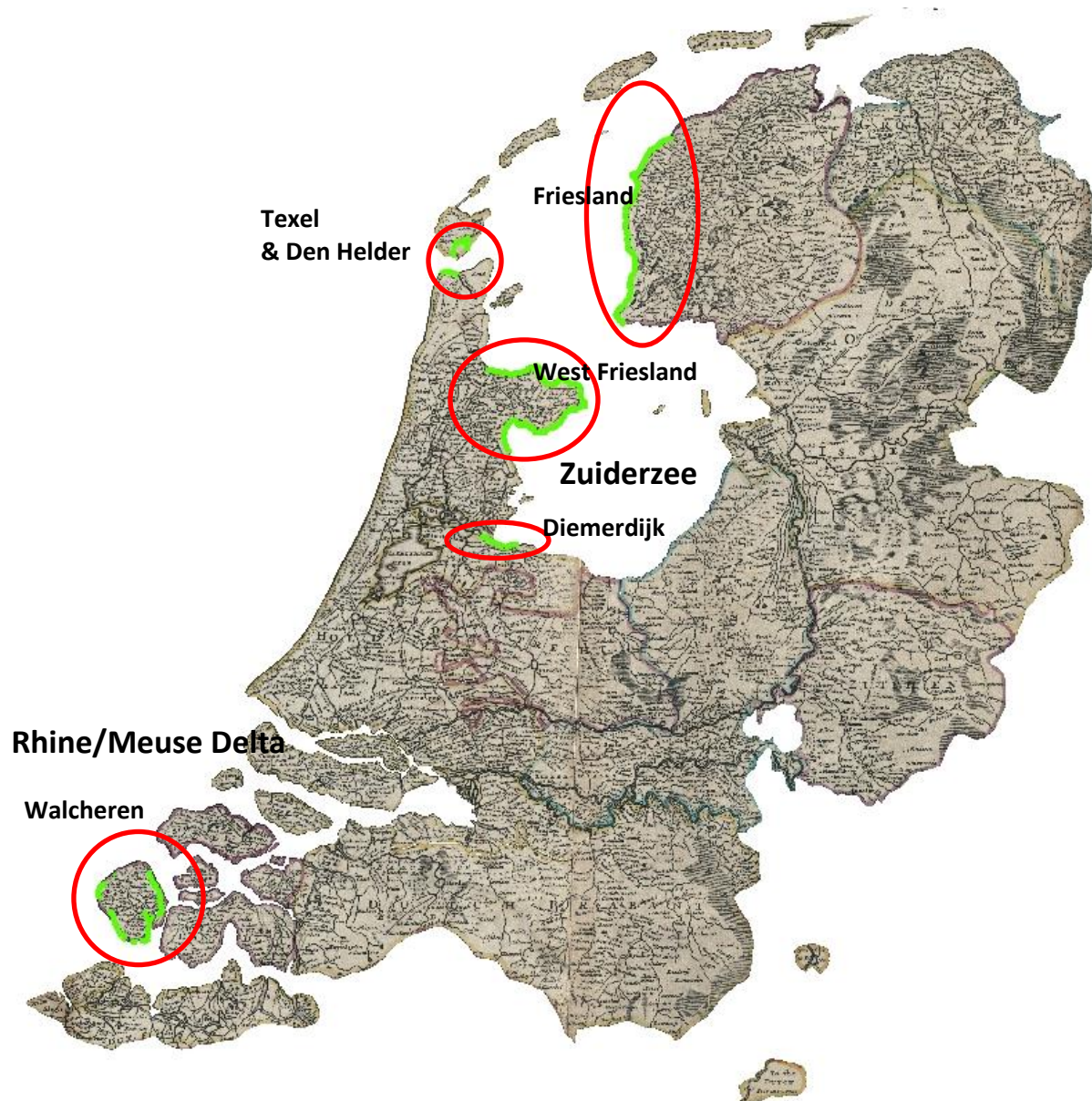


Figure 4.4 Shipworm Infestations in the Netherlands (green). Shipworms have wide environmental tolerances and they affected a large portion of the Dutch coastline, particularly in the “delta region” of Zeeland and the “Southern Sea region” that bordered Holland, Overijssel, and Friesland. The initial inspections took place along the *Westkappelse Zeedijk* on the Zeeland island of Walcheren and the *Drechterlandse Noorderdijk* in West Friesland. Base map: Herman Moll, A New and Exact Map of the United Provinces, or Netherlands, &c, 1720.

The specific species at the core of this drama was likely *Teredo navalis*, a marine bivalve of the family Terenidae.¹¹ Shipworms spend their adult lives almost entirely in submerged wood, negating the need for the protective sheath typical of mollusk with the exception of a helmet-like shell used as a boring tool.¹² Shipworms are sequential (protandric) hermaphrodites, can produce up to two million larvae per cycle, and depending on environmental conditions, can survive for several years.¹³ Their reproductive biology allows shipworms to multiply in ideal conditions at astonishingly high rates. Adult shipworms also have high temperature and salinity tolerances, though these tolerances vary according to population and stage in larval development. Their size also depends on environmental variables, particularly temperature, but can range from up to 25 cm in cooler waters to 60 cm in warmer waters. Because of their small size, one piece of wood could house multiple mollusks, presenting a serious threat to the stability of wooden structures. Additionally, their holes are barely visible from the outside. This meant that the Dutch would likely only detect their presence when the wood broke. *Teredo navalis* is one of several marine mollusk varieties, though most shipworm species prefer tropical or subtropical latitudes. In general, temperature, salinity, possibilities for dispersal, and to a lesser extent turbidity, limited shipworm distribution.¹⁴

¹¹ Linnaeus classified *Teredo navalis* in the 10th edition of his *Systema Naturae* in 1758. Carl Linné, *Systema Naturæ Per Regna Tria Naturæ, Secundum Classes, Ordines, Genera, Species, Cum Characteribus, Differentiis, Synonymis, Locis* (Holmiae: Salvius, 1758).

¹² Viktoras Didžiulis, "Invasive Alien Species Fact Sheet: *Teredo Navalis*," in *Nobanis Fact Sheets* (Nobanis: European Network on Invasive Alien Species).

¹³ K.N. Hoppe, "Teredo Navalis - the Cryptogenic Shipworm," *Invasive aquatic species of Europe; distribution, impacts, and management* (2002): 116-19.

¹⁴ Charles Howard Edmondson, "Teredinidae, Ocean Travelers," *Occasional Papers of Bernice P. Bishop Museum* 23, no. 3 (1962), 45; N. Balakrishnan Nair, "Ecology of Marine Fouling and Wood-Boring Organisms of Western Norway," *Sarsia* 8, no. 1 (1962): 1-88. Shipworms also tend to avoid waters with high sediment content. The areas

The natural history and success of the shipworm was tightly connected to the development of oceangoing travel. Shipworms occupy a unique and important ecological niche in ocean ecosystems considering the slow speed at which fungi and bacteria degrade wood.¹⁵ The development of ocean going vessels was a windfall opportunity for shipworms. Their ecological tolerances and high fecundity meant that they could dramatically expand their range by embedding themselves in the hulls of wooden sailing ships. Wooden coastal infrastructure also created new potential ecosystems for shipworms to flourish in foreign environments.¹⁶ Ships transported entire molluscan communities across the globe, yet historians have yet to incorporate this rich story of biological exchange into existing narratives of global ecological invasions.

The earliest European accounts of shipworms come from antiquity. The philosopher Theophrastus noted the deleterious effects of shipworms infestations on Greek ships. He was also the first to suggest a shipworm countermeasure, a coating of pitch on the hull to prevent infestation.¹⁷ The early modern period was undoubtedly an important era for shipworms as ocean shipping and warfare increased their opportunities for travel. European vessels created pathways for these mollusks to bridge distances difficult to traverse using natural means of dispersal. Christopher Columbus famously lost two ships to shipworms on his fourth voyage to the West

of Zeeland and North Holland that were hardest hit by the shipworm had low turbidity, whereas estuaries like the Western Schelde and intertidal zones like the Wadden Sea were less affected.

¹⁵ Hoppe, "Teredo Navalis - the Cryptogenic Shipworm," 117. For salinity tolerances, see: Peter Paalvast, "Ecological Studies in a Man-Made Estuarine Environment, the Port of Rotterdam" (Radboud Universiteit Nijmegen, 2014), 73.

¹⁶ James T. Carlton, "Molluscan Invasions in Marine and Estuarine Communities," *Malacologia* 41, no. 2 (1999): 439-54.

¹⁷ John Scarborough, *Medical and Biological Terminologies: Classical Origins* (Norman: University of Oklahoma Press, 1992), 65. There are numerous other accounts from antiquity dating back several thousand years to the Phoenicians Woods Hole Oceanographic Institution, "The History of the Prevention of Fouling," in *Marine Fouling and Its Prevention* (Annapolis, Maryland: United States Naval Institute, 1952).

Indies.¹⁸ Centuries later, Dutch sailors returning from the West Indies attributed the loss of Dutch ships to worm attacks in the Caribbean.¹⁹ The Golden Age Dutch naval officer Witte de With noted shipworm related damage to his ships on the coast of Africa and later in Brazil.²⁰ Indeed, *Teredo navalis* was one of the principle hazards for ocean travel throughout the early modern period.²¹

Shipworms attacked ships in Western Europe as well. They bored into the hulls of the Spanish Armada, for instance, as it lay in wait in Spanish and Portuguese ports to invade England in 1588.²² *Teredo navalis* was likely already in Dutch waters as early as 1680 as evidenced from dike inspectors in North Holland.²³ Interestingly, the species still has no proven geographic origin; it is a classic cryptogenic species.²⁴ Scholars are divided between those who favor Atlantic indigeneity and those that consider it a tropical invasive. Even if one accepts the earliest confirmed sighting of shipworms in the North Atlantic, this evidence still falls well within the range of Dutch trading missions to the tropics. Shipworms were certainly passengers on these voyages and there is nothing to contradict the assumption that they were indeed

¹⁸ Alan Burdick, *Out of Eden: An Odyssey of Ecological Invasion* (Farrar, Straus and Giroux, 2006), 185-203.

¹⁹ Joannes Goudsbloem, 1644 Maart 17-1644 December 14; 1645 Januari 1-1645 December 31. 1644. Archief van de Notarissen ter Standplaats Amsterdam. 5075. 1925A. Stadsarchief Amsterdam. Notarial accounts of West Indies freighters also noted the effect of shipworms in "English Virginia." See: Notary Pieter Capoen (15 Sep, 1645) *Minuten Van Bevrachtingscontracten*. Archief van de Notarissen ter Standplaats Amsterdam. 5075. 1587. Stadsarchief Amsterdam.

²⁰ Anne Doedens, *Witte De with 1599-1658: Wereldwijde Strijd Op Zee in De Gouden Eeuw* (Hilversum: Uitgeverij Verloren, 2008), 23, 80.

²¹ Robert Parthesius, *Dutch Ships in Tropical Waters: The Development of the Dutch East India Company (Voc) Shipping Network in Asia 1595-1660* (Amsterdam: Amsterdam University Press, 2010), 102.

²² Burdick, *Out of Eden: An Odyssey of Ecological Invasion*., 197. Hoppe, "Teredo Navalis - the Cryptogenic Shipworm," 117.

²³ José Mouthaan, "The Appearance of a Strange Kind of Sea Worm at the Dutch Coast, 1731," *Dutch Crossing: A Journal of Low Countries Studies* 27, no. 1 (2003), 4.

²⁴ Hoppe, "Teredo Navalis - the Cryptogenic Shipworm."

invasive.²⁵ There were many different species of shipworms, however, and it is impossible to tell which attached themselves to East Indiamens' hulls. Evidence for indigeneity largely depends on the assumption that deeper archival evidence would yield new information. Despite the popular contemporary belief that shipworms were novel threats, there is evidence of wood damage in France as early as 1670 and significant evidence that boring creatures had been a persistent and expensive challenge in North Holland piles since 1680, though no earlier evidence is available.²⁶ These may, or may not have been *Teredo navalis*. The environmental range of *Teredo navalis* precludes any easy conclusions.

The abrupt timing of the shipworm arrival may have much to do with the changing physical environment of the Netherlands in the 1730s. The Dutch littoral environment underwent a significant transition during this era. Between 1712 and 1750, a series of warm, dry summers reduced the fresh water influx of rivers into the Zuider Zee, increasing its salinity. Temperatures of coastal waters also would have increased. The same would have been true of North Sea Coast and the Western Scheldt in Zeeland where dike inspectors first identified the infestation in 1730. These conditions were an ideal environment for shipworms and may have accounted for their

²⁵ Dutch East India Trading Company records detail some of the adaptations attempted to combat the shipworms, including multiple methods of sheathing ship hulls. Wendy van Duivenwoorde, "Doppelte Standards: Zweifache Beplankung Im Niederländischen Schiffbau Des Späten 16. Und Frühen 17. Jahrhunderts," *Skyllis: Zeitschrift für Unterwasserarchäologie* 5, no. 2 (2002): 112-22; Robert Parthesius, *Dutch Ships in Tropical Waters: The Development of the Dutch East India Company (Voc) Shipping Network in Asia 1595-1660*, Amsterdamse Gouden Eeuw Reeks (Amsterdam: Amsterdam University Press).

²⁶ Theodorus Speeleveldt, *Brieven over Het Eiland Walcheren* (The Hague: Immerzeel en comp., 1808), 65; H. Schoorl, *Zeshonderd Jaar Water En Land: Bijdrage Tot De Historische Geo- En Hydrografie Van De Kop Van Noord-Holland in De Periode ± 1150-1750* (Wolters-Noordhoff, 1973). Shipworms also may have had paleohistoric origins in the North Sea area. In 1784, the *Transactions* of the Holland Academy of Sciences reported the discovery of fossilized worm-eating wood in Belgium. If this were indeed *Teredo navalis*, this evidence would not have had any bearing on their modern distribution, however. , *Hollandsche Maatschappye der Weetenschappen te Haarlem, Verhandelingen Uitgegeven Door De Hollandsche Maatschappye Der Weetenschappen Te Haarlem*, vol. 21 (Haarlem: Jan van Walre, 1784), 236.

explosive growth.²⁷ These decadal temperature variations do not give any new hints about their ultimate origins. What seems certain, however, is that a confluence of environmental factors catalyzed their outbreak in the 1730s. (Figure 4.5)

²⁷ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 571-572.

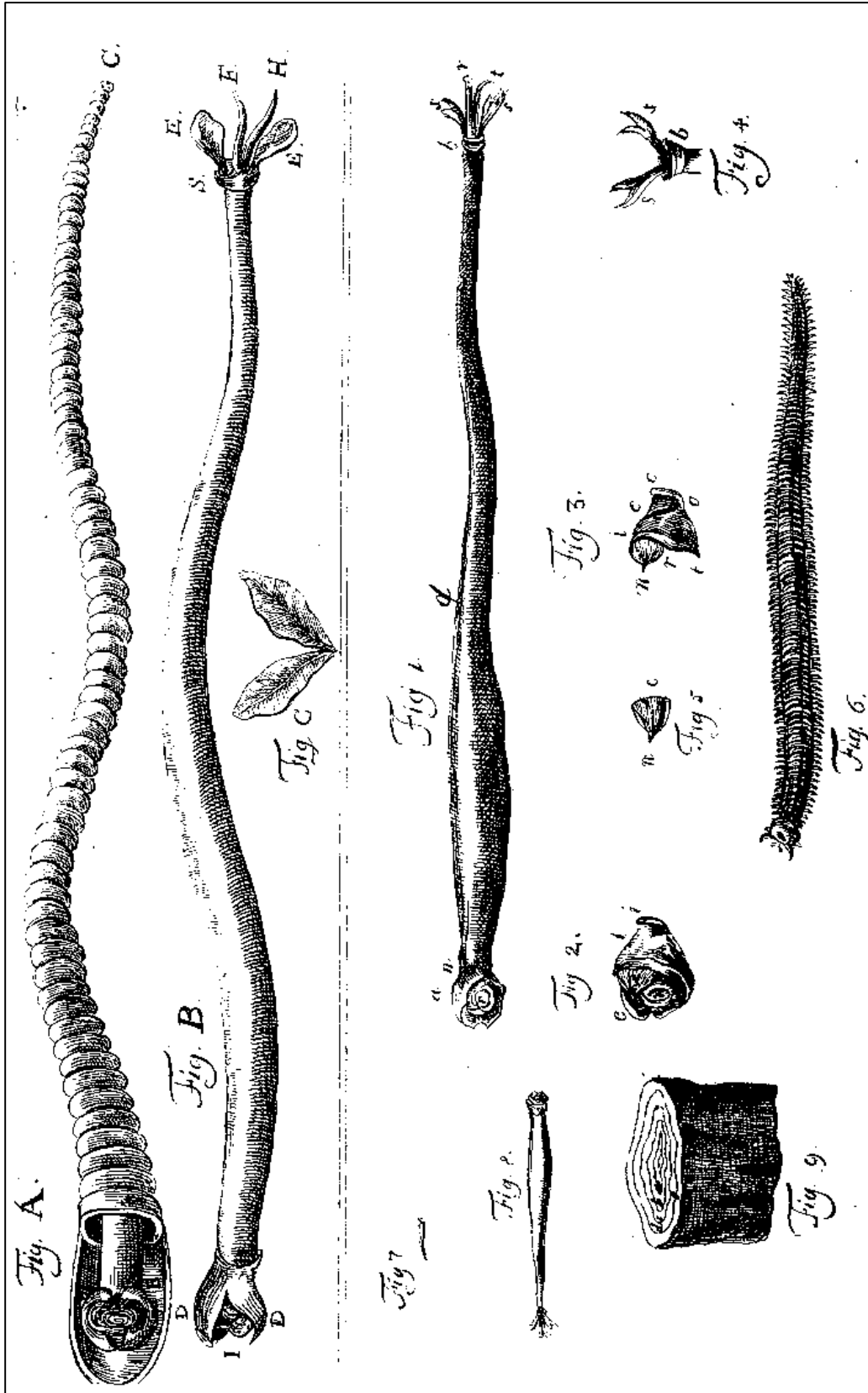


Figure 4.5 "Pictures of the so-called pile worm." From Rousset, *Account of the Origin, nature, and condition of the sea worms that bore through the ships and pileworks (Aanmerking over den oorsprong, gesteldheid en aard der zeevormen, die de schepen en paaalwerken doorboren)* (Leiden, 1733) Shipworms catalyzed widespread scientific interest and publications on the natural history and biology of the mollusks. This widely reproduced image depicts the various parts of the worm as described in Rousset's account.

Dutch reactions to the shipworm epidemic were separated roughly into two waves. Water management officials and provincial governments dominated the first wave of response, which occurred immediately after the discovery of the infestation in 1730. This institutional response concerned itself primarily with the economic and technological implications of the shipworm threat. A popular and much more reactionary set of responses altered the institutional reaction in 1732. Two events marked this second wave of response. The first was the publication of an article in the newspaper *Europische Mercurius*. It highlighted the natural history, engineering challenges, possible remedies, and providential implications of the epidemic.²⁸ Elements of this account were taken up by pamphleteers, ministers, and dike officials and treated to separate discussions. The second was a request by the *Staten van Holland* for popular remedies in 1732. It was advertised in the Netherlands and internationally and resulted in a series of letters containing “inventions,” “remedies,” and “least costly means” of combatting the shipworm.²⁹ These remedies ranged from the plausible to the fanciful and proposed innovations for the wooden constructions, the dikes themselves, and improved machines to mechanically drive the wooden piles into the earth. They included official requests for patents, letters written to the *Staten van Holland* as well as dedicated pamphlets. The providential discourse interacted with each of these currents. The perception of divine influence played a role in nearly every aspect of shipworm response. It informed the debate over origins, meaning, and the solution to the threat.

²⁸ "Bericht Wegens De Plaage Der Wormen in Het Paalwerk Der Dykagien Van Holland En Zeeland."

²⁹ "Memorie Overgelevert aan Hunne Edel, Groot Mogende de Heeren Staten van Holland...inhoudende zeker gereed, duurzaam, en min kostbaar Middel." 1732. Gedeputeerden van Haarlem ter Dagvaart. 3.01.09. 1238. Nationaal Archief.

Shipworm Responses: Institutional

Institutional response to the shipworm epidemic began in 1730 following the storm that shattered piles on the *Westkappelse Zeedijk* in Zeeland, but soon spread across the coastal Netherlands. In north Holland following a similar storm in 1731, the managers of the *Drechterlandse Noorderdijk* began to receive similar reports of worm infestations and a provincial commission made a special inspection to determine the extent of damage.³⁰ Dikes in North Holland were significantly different in construction from the southwestern Delta region of Zeeland, but they shared a common vulnerability in that the barriers constructed in front of dikes also contained wooden components.³¹ The initial reactions by water authorities in Holland offer a clear view of the information deemed most relevant to Dutch water authorities. They were primarily interested in the degree of damage, they offered risk assessment, and they produced detailed accounting of the financial costs of repair. This technocratic response was broadly similar to flood response.

On 7 November 1731, Pieter Straat and Broer Smit made the first inspection of the dikes in West Friesland (a region of North Holland). Straat and Smit were members (*heemraden*) of the local waterboard called Drechterland. This first inspection revealed that almost ninety-five percent of dikes were infected. Only a month after the publication of their inspection report the following year, the *Staten van Holland* ordered a special commission to evaluate the extent of

³⁰ Cornelis Alard Abbing, *Geschiedenis Der Stad Hoorn, Hoofdstad Van West-Vriesland Gedurende Het Grootste Gedeelte Der 17e En 18e Eeuw, of Vervolg Op Velius Chronyk*, vol. 2 (Hoorn: Gebr. Vermande, 1842), 243. In fact, “rumors” had spread from Texel and Den Helder that their own piles had been broken and “gnawed through.” This may have been the final piece of evidence needed to push for the special inspection.

³¹ For a comparison of the Zeeland style dikes with sea dikes common in other regions of the Netherlands, see: Robert J. Hoeksema, “Designed for Dry Feet Flood Protection and Land Reclamation in the Netherlands,” (Reston, VA: American Society of Civil Engineers, 2006), 93-97.

damage and estimate costs. Similar processes were common following flood disasters or during dike inspections, which was important both to facilitate repairs and to reassess the tax burden on inhabitants.³² Dike officials also made several useful observations about the degree of damage. To begin, the only dikes affected were *kaaldijken*, those protected by wooden barriers like palisades (Figure 4.6) or those that had a wooden framework containing seaweed mats and stone. (Figure 4.7) Both designs were necessary in areas with little to no land on the seaward side of the dike. In those areas without *voorland* (land in front of the dikes inundated only at high tide), the wave breaking benefits of these dikes were unnecessary and so a less costly earthen dike was used. Pile-protected dikes were also a relatively recent creation.³³

³² Westfries Archief 1562.1442

³³ A.A. Beekman, *Het Dijk- En Waterschapsrecht in Nederland Vóór 1795*, vol. 2 ('s Gravenhage: M. Nijhoff, 1907), 1269.

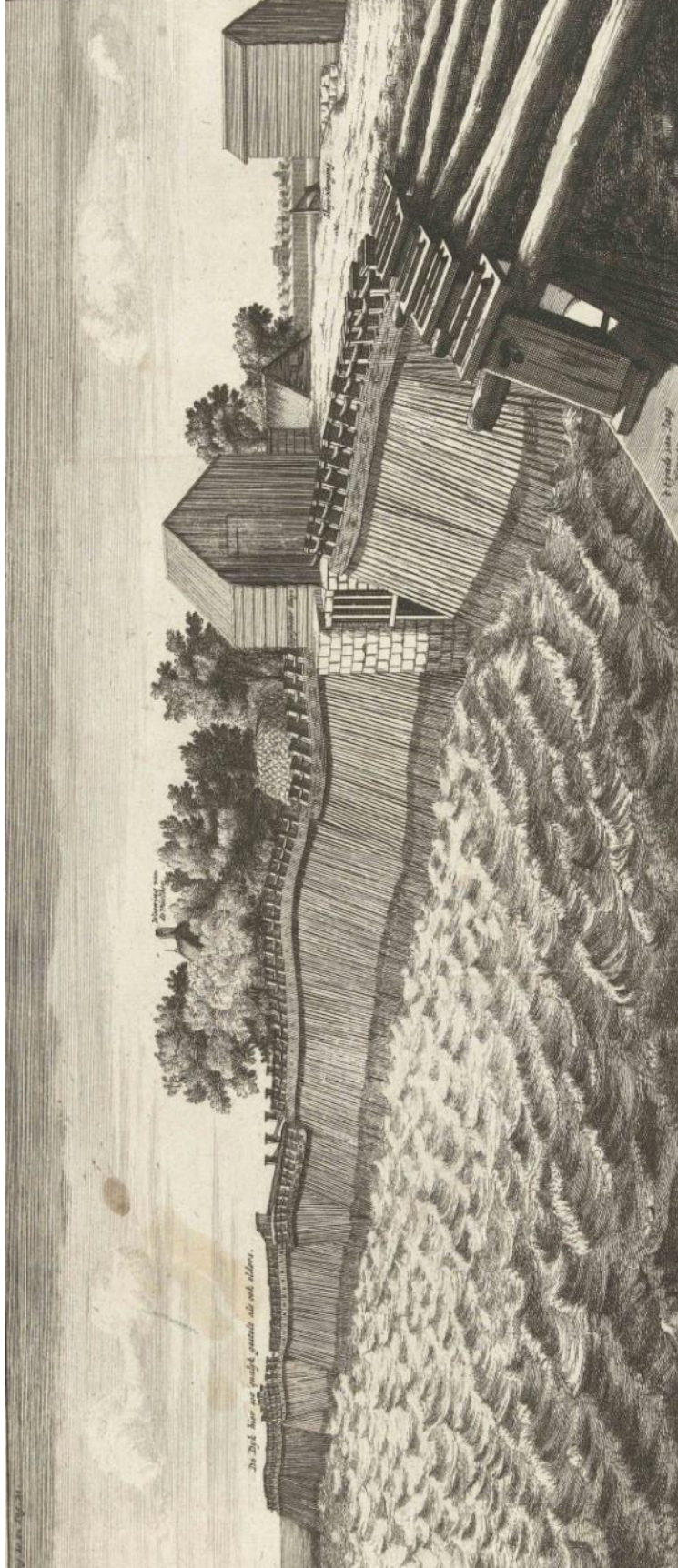


Figure 4.6 *Paalddijken* on the Zuiderzee near Muiden. *Paalddijken* were a form of “*kaaldijk*,” which meant that water touched them during every tide. This design was used on the Diemerdijk to the east of Amsterdam on the southern coast of the Zuiderzee. Palen are used as a palisade in this design. *The terrible condition of the sea dike from Diemen to Jaap Hannes (2nd part) (De slechte toestand van de Zeedijk vanaf Diemen tot aan Jaap Hannes (tweede deel), 1705).*

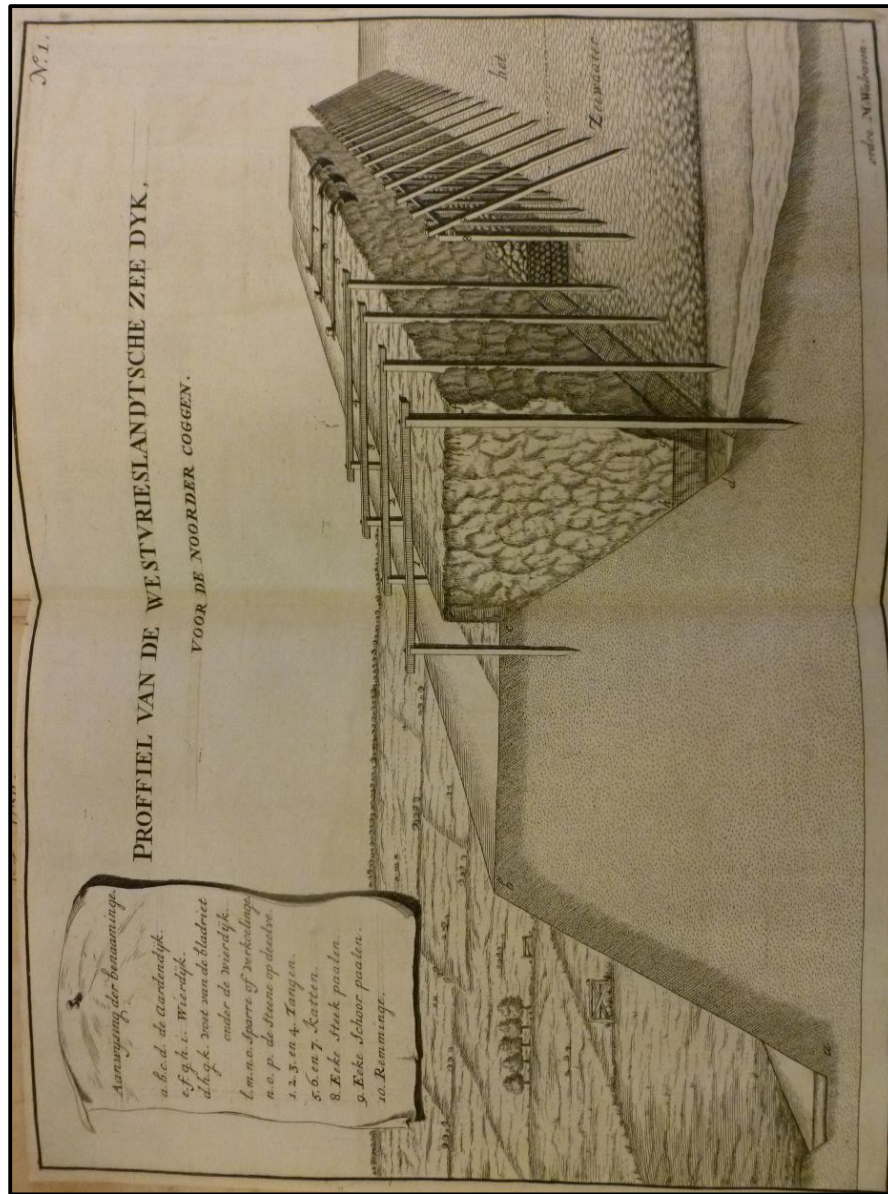


Figure 4.7 This “Profile of the West Frisian Sea Dike” exhibits the various parts of a North Holland “wierdijk.” This was a commonly employed style of dike in West Friesland whose earthen portion was protected by a thick mat of dried seaweed (*wier*). These were kept in places by wooden stakes. *Nationaal Archief*. The Hague. Toe. 3.01.05 Inv. 3932, pg. 94.

By the 1730s, the Dutch along the Zuiderzee converted significant portions of the coast to dikes employing wooden elements. In some cases, this was a response to prior disaster.

Following the Christmas Flood of 1717, for instance, nearly the entire coastline of Friesland was rebuilt with wooden piles.³⁴ In other areas such as the strip of land between the cities Amsterdam and Muiden, *paaldijken* had been mandated as early as the fifteenth century in response to the St. Elizabeth's Flood of 1421.³⁵ There were also other more creeping environmental factors that forced the change. Decreasing *voorland* was a serious problem during the late medieval and early modern periods, particularly in the Zuiderzee region.³⁶ Increasingly powerful tidal currents combined with the effects of land subsidence behind the dikes (due to drainage) to seriously undermine the stability of many West Frisian coastal dikes.³⁷ As the coast crept closer to the earthen dikes, wooden barriers were increasingly necessary coastal protection.

The Drechterland inspectors also realized that worm infestation was not uniform, even in those dikes and sluices with wooden elements. They recognized that wood in fresh water was unaffected, as were those wooden sections only temporarily submerged in salt water, for instance during high tide. These would be important details in the coming years when authorities struggled to dampen popular misunderstandings of the shipworm threat.³⁸ In addition to documenting the extent and degree of damage, dike inspectors also calculated the cost of repair.

³⁴ Ibid., 1271.

³⁵ Alfons Fransen, *Dijk Onder Spanning : De Ecologische, Politieke En Financiële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864* (Hilversum: Verloren, 2011), 47.

³⁶ Piet Boon, "Voorland En Inlagen: De Westfriese Strijd Tegen Het Buitenwater," *West-Frieslands Oud en Nieuw* 58(1991): 78-113.

³⁷ de Bruin and Aten, *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676*, 9.

³⁸ *Beschryvinge, Van De Schade En Raseringe Aan De Zee-Dyken Van Noort-Hollanden West-Vriesland, Door De Worm in De Palen, En De Daar Op Gevolgde Storm, En Vervolgens: Waar by Komt Een Beschryving Van Een Nieuwe Water-Machine* (Hoorn: Jacob Duyn, 1732).

Similar to the aftermath of the Christmas Flood in Groningen, dike maintenance and repair was a complicated process and one that became increasingly difficult for local authorities to manage by the eighteenth century. *Wierdijken* and *paaldijken* in particular added considerable expense to earthen dikes because their wooden components required consistent upkeep. Groningen and West Friesland both underwent increased centralization by provincial authorities in order to manage the increasing cost of dikes.

Unlike in Groningen where two antagonistic authorities (*Stad Groningen* and the *Ommelanden*) vied for political and economic authority, West Friesland's political landscape was more unified. It was also more unified from the perspective of flood risk. Already by the thirteenth century, inhabitants began connecting the many smaller dikes of the province that connected the primary cities of Hoorn, Enkhuizen, Alkmaar, and Medemblik, thus creating a large *Omringdijk* (surrounding dike) that completely encapsulated West Friesland. This was a fundamental improvement from a flood risk perspective, but it simultaneously made water management vastly more expensive. Beginning in the mid-seventeenth century, the entire region of West Friesland underwent a centuries-long transition from local management to the communalization of dike responsibility (*gemeenmaking*).³⁹ Into the eighteenth century, therefore, West Frisian water boards required ever-increasing funds from the province of Holland.⁴⁰

³⁹ *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676*. For a broader perspective on the commonalities (and differences) between processes of *gemeenmaking* across the North Sea, see: Milja van Tielhof, "Forced Solidarity: Maintenance of Coastal Defences Along the North Sea Coast in the Early Modern Period," *Environment and History* (forthcoming).

⁴⁰ Funding repairs to the dikes is an entirely separate and complicated part of the shipworm narrative involving tensions between provinces and between provincial committees and local authorities. For the conflict between Utrecht and Holland, see: H.P. Moelker, "De Diemerdijk: De Gevolgen Van Paalwormvraat in De 18e Eeuw," *Tijdschrift voor Waterstaatsgeschiedenis* 6(1997): 46-52; Fransen, *Dijk Onder Spanning : De Ecologische, Politieke En Financiële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864*. The most thorough treatments of the

Estimates of the costs of repairing the dikes presented by water boards were not calculations of damage to infrastructure, but rather the cost of making improvements. Costs varied depending on the plan and method of repair. Seger Lakenman, secretary of the water board Drechterland, introduced a plan requiring greater emphasis on early alerts in the winter for dike breaches. He also proposed expanding a system of secondary, landlocked dikes behind the sea walls (*inlaagdijken*). This medieval technique had been employed in West Friesland for centuries as a stopgap for the problem of decreasing *voorland*.⁴¹ Lakenman also suggested strengthening existing dikes with stone. The total cost for this plan was the considerable sum of 1.6 million guilders.

Cost estimates like Lakenman's were working proposals, but also appeals for disaster assistance from the province. None of the plans for dike repair could be funded directly from dike fees assessed upon landowners (called *verpondingen*). The massive cost of repair required additional subsidies from the province as well as reduced provincial taxation. For this reason, authors published and distributed their plans as pamphlets and addressed them to the governors of Holland. These pamphlets included the substantial costs of repair as well as the authors' justification for the potential communal investment. A breach in the Omringdijk, Lakenman and others claimed, would weaken the "fortress" of Holland, allowing entrance to the invading

financial implications of the shipworm epidemic in Holland are: C. Baars, "De Paalwormfurie Van 1731-1732 En De Schade Aan De West-Fries Zeedijk," *Waterschapsbelangen* 73(1988): 809-15. "Herstel Van De Paalwormschade Aan De Zuiderzee Dijken Beoosten Muiden," *Waterschapsbelangen* 74(1989): 437-46.

⁴¹ de Bruin and Aten, *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676*, 9.

waters.⁴² These claims situated West Friesland in the valuable (and vulnerable) position of front line defense against a watery assault on North and South Holland.

Water management professionals' initial reports and plans for improvement were descriptive and argumentative and tended to rely on tried-and-true methods of dike repair. Shipworms, according to this view, were simply manifestations of a broader flood threat. Their chief concerns were economic and managerial and, therefore, predominantly pragmatic. Through 1731 and into the early part of 1732, reactions to the shipworm epidemic focused on returning affected regions to a state of flood preparedness. Initial plans were primarily variations on existing models. The first plan to protect Holland dikes simply removed the wooden frame (*krebblingen*) that surrounded the wave-breaking seaweed mat and inserted the piles through the mats as a sort of stake. While this appeared to help prevent shipworm infestation, the seaweed mats easily washed away.⁴³ Technocrats increasingly realized that older methods of improving dikes were ineffective on technological grounds alone.

By 1732, one can identify a growing rhetorical conviction that new environmental circumstances required novel solutions and perhaps even drastic change in dike engineering to combat the shipworms. Near the end of his proposal, for instance, Seger Lakenman argued that

⁴² "Fortresse" was an oft-repeated analogy in repair and design proposals, particularly in North Holland. The poem L. T and J. B, *Nederlant Ten Toneele, Van Godts Regtvaardige Wormstraf Gekozen* (Groningen: Laurens Groenewout, 1732) made a similar claim in 1732. Seger Lakenman, *Het Wonder Oordeel Godts, Ofte Een Kort Verhaal Van De Ongehoorde Bezoeking Dezer Provintie Door Zekere Plage Van Zee- Wormen*, ed. Dykgraad en Heemraden en Waarschappen van Drechterland, vol. 16850 (1732). The Netherlands has a deep history of inter-provincial flooding, but this "fortresse" concept was no doubt reinforced by the most recent river flood in 1726 that spread out across most of South Holland into North Holland. Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 524-531.

⁴³ C. Baars, "Nabeschouwing over De Paalwormplaag Van 1731-32 En De Gevolgen Daarvan," *Waterschapsbelangen* 75(1990), 504.

water authorities may need to consider “entirely new forms of dike construction.”⁴⁴ This realization only gained traction into the next period of dike response lasting from 1732-1734 when not only dike engineering, but also the moral, historical, and scientific foundations of understanding the plague were presented, contested, and renegotiated.

Shipworm Responses: Public

Institutional investigations of shipworm infestations were ongoing when the Dutch newspaper, *Europische Mercurius*, released a special report on the shipworm epidemic. Their “Report on the Plague of Worms in the Pileworks of Dikes in Zeeland and West Friesland” summarized what was known about the infestation. Between the publication of the report in 1732 and the decision by the province of Holland to invest in dike reconstruction in 1733, foreign experts, Dutch water managers, ministers and laypeople presented alternate explanations and solutions for the disaster that had significant implications for Dutch response and adaptation.

The *Europische Mercurius* also highlighted a number of new dialogues, particularly those related to the cultural and ideological implications of the epidemic. While there was likely ongoing and intense international discussion of the shipworm problem prior to its publication (so it cannot be said to have instigated this wave), it certainly popularized the cultural, political, and theological dimensions of the shipworm epidemic. One critical issue related to misinformation. The *Mercurius* noted several problematic foreign news reports about the shipworm epidemic with egregious or economically damaging implications that had already begun to spread throughout Europe. One High-German account reported the most troubling assertion that “the

⁴⁴ Lakenman, *Het Wonder Oordeel Godts, Ofte Een Kort Verhaal Van De Ongehoorde Bezoeking Dezer Provintie Door Zekere Plage Van Zee- Wormen* (1732), 15.

great and beautiful city (Amsterdam) is near its destruction, all of the houses which stand upon stakes thrust in the ground, are in very great danger of being destroyed by the worms that rapaciously eat through them.”⁴⁵ Naturally, this was problematic for the Dutch, not only because of the existential danger to those living in the city, but because Amsterdam was still an important economic entrepôt of Europe in 1732. Dutch contemporaries worried about the international reach of these untruths when letters sent from relatives abroad and business partners to Amsterdam asked if these claims were true.⁴⁶

Despite the claim that Amsterdam’s merchants were fleeing as their houses began to sink (a print was distributed out of Hannover visualizing the “news” of Amsterdam’s ongoing destruction) the *Mercurius* countered by assuring its readers of the falsity of this claim. The worms, as had already been determined by dike inspections, only lived in salt water and Amsterdam’s buildings rested on foundation piles driven into “fresh” (and anoxic) watery soils. A second account coming out of Bern, the *Mercurius* reported, presented a hyperbolic account of the size of the worms and the extent of devastation. This report claimed that two-foot long worms had eaten through entire sections of the earthen dike bodies leaving “uncommonly large holes.” (Figure 4.8) Once again, the *Mercurius* assured its readers that these were “false descriptions.”⁴⁷

Many groups and some individuals attempted to stem the flow or explain this wave of mis- (or dis-) information. When the *Staten Generaal* of the Netherlands declared a day of

⁴⁵ "Bericht Wegens De Plaage Der Wormen in Het Paalwerk Der Dykagien Van Holland En Zeeland," Part 2, 107.

⁴⁶ J.R. de Missy, *Aanmerkingen over Den Oorsprong, Gesteltheit, En Aard Der Zeewormen: Die De Schepen En Paal-Werken Doorboren Door Den Hr. Rousset* (Lyden: Gysbert Langerak, 1733).

⁴⁷ "Bericht Wegens De Plaage Der Wormen in Het Paalwerk Der Dykagien Van Holland En Zeeland," 107.

thanks, fasting, and prayer in response to the many disasters of the 1730s including the “uncommon plague of destructive sea worms,” they made sure to acknowledge that although the shipworms were disastrous, “through God’s goodness [they have] not spread nearly as far or as much as the unsubstantiated rumors would have one believe.”⁴⁸ The *Mercurius* attributed the popularity of these accounts to a “snowball” effect the compounded untruths and exaggerated reports. Other commentators were less gracious. Natural historian Jean Rousset de Missy contended that “false Reports on this Subject, which have been spread either by the Enemies or the Enviars of the Wealth, Prosperity and Happiness of the Republick” may have been to blame.⁴⁹ Shipworm misinformation, therefore, had geopolitical as well as economic implications.

⁴⁸ *Plakaat (17 Feb) 1733*. Archief van de Burgemeesters: Publicaties van de Staten-Generaal en van de Staten van Holland en West-Friesland. 5022. 11. Stadsarchief Amsterdam.

⁴⁹ *Observations on the Sea- or Pile-Worms Which Have Been Lately Discover'd to Have Made Great Ravages in the Pile-or Wood-Works on the Coast of Holland, &C: Containing a Particular Account of Their Make and Nature, and of the Use of Their Several Parts in Boreing and Feeding; with a Particular Description of Their Cells or Lodgments in the Wood* (J. Roberts, near the Oxford Arms in Warwick-Lane., 1733), 1.



Figure 4.8 This German image of shipworms depicts them as sea monsters literally eating at the foundations of North Sea society and emphasizes the extent, origin (West Indies), and threat of the worms. Elias Baeck – *Depiction of the very damaging, unknown sea worms which came from the West Indies first to East Friesland, Texel and Amsterdam and resulted in indescribable damage (Abildung deren höchst schädliche unbekannten See-Würmer: welche aus West-Indien Zuerst nach Ost-Friesland, in den Texel, und Amsterdam gekommen, und alldorten unbeschreibliche Schaden verursacht)* 1732. <http://sammlungen.ub.uni-frankfurt.de/4360341>

Possible political motivations aside, both false accounts hinged upon misconceptions regarding the biology of the shipworm, whether due to its size or environmental range. The biology and origin of the organism was, therefore, an important consideration with economic implications, but also for religious interpretations and ultimate decisions regarding planned changes to dike design. These misconceptions, and the lacunae of biological information then available about shipworms, sparked an outpouring of scientific literature.⁵⁰

Shipworm Responses: Natural History

Natural historical scholars concerned themselves primarily with the cataloging of natural traits and determining the origin of the animal. If the animals were indigenous and the epidemic was a natural phenomenon, a different set of response would be required than if it were an unknown, foreign invader or if the epidemic were divinely ordained. The natural philosopher Gottfried Sellius from Gdańsk produced the most complete and influential early work. Sellius based his *Natuurkundige Histori van den zeehoutworm ofte houtvreeter* (Natural history of the shipworm or wood eater) on empirical observation of infected wood (sent to him from the Netherlands) as well as *in situ* investigations performed during later visits.⁵¹ Sellius recognized that these “worms” were, in fact, mollusks, and more importantly, that salinity and temperature conditioned the shipworms’ fecundity.

⁵⁰ These accounts were in keeping with ongoing efforts to catalog and describe the natural world and employed the newest technologies. Microscopy in particular was a favorite tool for natural historians. Indeed, the French-born scholar Pierre Massuet claimed that due to the shipworm epidemic, interest in natural history was amplified and “men have never used microscopes more than now.” Pierre Massuet, *Wetenswaardig Onderzoek over Den Oorsprongk, De Voortteling, De Ontzwachteling, Het Maaksel, De Gedaante, De Gesteltheit, Den Arbeidt, En De Verbazende Menigte Der Verscheide Soorten Van Kokerwurmen Die De Dykpalen En Schepen Van Enige Der Vereenigde Nederlandsche Provintsien Doorboren* (Amsterdam: Wor, 1733).

⁵¹ Gottfried Sellius, *Natuurkundige Histori Van Den Zeehoutworm, Ofte Houtvreeter, Zynde Koker- En Meerschelpigh, Inzonderheit Van Den Nederlantschen ...: Eerste Deel* (Utrecht: H. Besseling, 1733).

Sellius and other natural historians based their biological descriptions on empirical investigation, but their treatment of shipworm origins was more theoretical, albeit based on their understanding of environmental change and shipworm ecology. Frenchman Jean Rousset de Missy, for instance, believed that the shipworms were actually endemic to Europe. "These Worms are no new Things on our Coast," he argued, "Many Persons remember to have seen Worms of the same Kind about Fifty Years ago."⁵² De Missy argued that environmental factors closely limited their growth and size. They appeared, he stated, "not till after the Dog-Days: And a severe Winter following, it destroy'd both them and the Seeds of them, before they became of any considerable Big-ness."⁵³

Sellius agreed that the worms were likely endemic to northern Europe and linked their explosive growth to increases in salinity.⁵⁴ Interestingly, Sellius and de Missy's findings echo arguments about the importance of environmental conditions posited a year earlier in the *Europische Mercurius*. "The attack by the worms," it stated in 1732, "could have been the result of the increased saltiness of the sea, which in the previous year of 1731, due to lack of the usual rain and snowfall, as well as the lessening river water, and evaporating heat, would not only have prevented a certain degree of replenishment, but also retained a majority of salt."⁵⁵ The *Europische Mercurius* unfortunately does not reveal the source of this information, but it remains an early and likely influential contribution to the debate on shipworm origins.

⁵² De Missy, *Observations on the Sea- or Pile-Worms Which Have Been Lately Discover'd to Have Made Great Ravages in the Pile-or Wood-Works on the Coast of Holland, &C: Containing a Particular Account of Their Make and Nature, and of the Use of Their Several Parts in Boreing and Feeding; with a Particular Description of Their Cells or Lodgments in the Wood*, 7.

⁵³ *Ibid.*, 7.

⁵⁴ Baars, "De Paalwormfurie Van 1731-1732 En De Schade Aan De West-Fries Zeedijk," 809.

⁵⁵ "Bericht Wegens De Plaage Der Wormen in Het Paalwerk Der Dykagien Van Holland En Zeeland" Part I, 300.

Dutch natural historians were far from dispassionate in their analysis and they understood that the shipworm epidemic was a prime opportunity for professional advancement if framed in the correct manner. They self-consciously promoted their knowledge as a tool to combat this very Dutch plague. Many, therefore, appealed to the patriotic inclinations of their readers, clothing their studies in patriotic garb. “Anyone out of sincere love for their beloved fatherland,” West Frisian surgeon Cornelis Belkmeer argued, is obliged “to search for measures with which to conquer this enemy.”⁵⁶ Many natural historical treatises even went so far as to offer one or several “remedies” or “measures against the worms.” These efforts highlighted their own contributions to the natural history of the shipworm. Most promoted solutions that employed their own findings. Zacharias L’Epie, for instance, described the shipworm in detail before offering multiple options that employed his claims about shipworm tolerance for environmental conditions.⁵⁷ Belkmeer focused on the reproductive abilities of the worms, thinking that this was the most promising method of stemming the invasion. “The reproduction and increase of the animals,” he stated, should be combatted by using “iron scrapers and stiff brushes” to clean off the slime that coated the interior of shipworm passages.⁵⁸ Interestingly, the reproduction of shipworms was one of the more hotly contested dimensions of shipworm natural history. Other

⁵⁶ Cornelis Belkmeer, *Naturkundige Verhandeling of Waarneming, Betreffende Den Hout-Uytraspense En Doorbooren De Zee-Worm*, vol. 16911 (Amsterdam: J. Ratelband en Compagnie, 1733), 43.

⁵⁷ Zacharias L’Epie, *Onderzoek over De Oude En Tegenwoordige Natuurlyke Gesteldheyt Van Holland Dog Voornamentlyk West-Vriesland Ten Opzichte Van Deszelfs Rivieren En Landen, Aanwas, Ophooging, Zakking, Laagte En Dykagie...* (Amsterdam: Erven van J. Ratelband, 1734): 159-182.

⁵⁸ Belkmeer, *Naturkundige Verhandeling of Waarneming, Betreffende Den Hout-Uytraspense En Doorbooren De Zee-Worm* (Amsterdam: J. Ratelband en Compagnie, 1733), 44.

scholars believed shipworms came from eggs or subscribed to the Aristotelian notion that worms arose out of putrification.⁵⁹

Natural historians were not the only group to offer opinions about the origins of shipworms or present practical suggestions about how to combat the shipworms. The *Mercurius* article touched off a flood of pamphlets, requests for patents, and remedies from laymen who considered themselves “upright patriots” with “hearts and hands lifted to the almighty.”⁶⁰ These documents preserve not only their appeals and innovative suggestions, but also the deliberations of provincial authorities as they tested the more promising submissions. This was a striking new development relative to other disasters that underlined the national, rather than merely local, character of the shipworm threat.

Pamphleteers often contended that the worms arrived on the hulls of East or West Indiamen. Jacobus Harkenroht opined that the worms could have arrived from the West Indies or perhaps via the trading networks in India.⁶¹ Even if their arguments never mentioned a discrete origin, many commentators considered the worms invasive. Commentators often likened shipworms to invading armies. Johannes Kemner, for instance, described the worms in martial terms, calling them “a powerful folk” with “thousands of legions that attack with thrusting harpoons sharper than daggers.”⁶² This analogy coupled well with commentators’ own feelings

⁵⁹ Rousset, for example, subscribed to the Aristotelian idea. See: Mouthaan, “The Appearance of a Strange Kind of Sea Worm at the Dutch Coast, 1731,” 8.

⁶⁰ Letter from Frederick Duim, 23.

⁶¹ Jacobus Isebrandi Harkenroht, *Worm in Nederlands Paalwerk Voor De Zeedyken* (Groningen: Harmannus Spoormaker en Laurens Groenwout, 1733), 63.

⁶² J. Kemner, *Monstreuse Zeewurm Doorknagende Het Posten Paalwerk in De Provincie Van Stadt En Lande En Wel Voornamentlyk in De Nabuirige Provincie Van Vriesland in Het Jaar 1732* (Groningen: Pieter Bandsma, 1732), 5.

that they were besieged within a “fortress” under attack by shipworms. Worms were an external menace—one with indeterminate origins, but ultimately alien.

The *Mercurius* also touched off a flood of patent requests and remedies for the epidemic from the public at large sent to the *Staten van Holland*. The connection between the *Mercurius* and the *Staten* is unclear, but most letters followed a rubric laid out the *Mercurius* article. Effective measures, it stated, must “1. be repaired in a way that prevents further damage from the worms 2. Protect against the violence of the sea so that people can live peacefully 3. Do so using the least costly methods.”⁶³ The cheapest manner to achieve these goals was to retain the basic form of the existing dikes, including the use of piles.

The *Staten van Holland* received dozens of suggestions that offered either mechanical or chemical solutions to the epidemic while retaining the basic design of the dikes. Many solutions were chemical compositions of toxic elements thought to poison the shipworms. Mercury or quicksilver was a common suggestion, as was pitch.⁶⁴ One Silesian suggestion subscribed to the Aristotelian notion of worm reproduction and thus promoted the application of sulfur oil to combat putrifaction.⁶⁵ Other authors used more benign or exotic elements they felt could protect the existing piles.

Still other suggestions were purely mechanical. Rather than coating the wooden elements in poison or pitch, some authors suggested replacing them with metal alternatives. Henricus

⁶³ "1718 January," *Europische Mercurius* 1718, 304-305.

⁶⁴ The frequent mention of pitch in remedies is circumstantial evidence that adaptations already developed for ships were being considered for use on dikes. One of the most common adaptations to shipworms since antiquity was to coat the hulls in pitch. Institution, "The History of the Prevention of Fouling." Surprisingly, little documentation on shipworm infestation in dikes mentions shipping, despite the long experience of mariners with the threat.

⁶⁵ This came from the letter by Charles Frederick de Baudiss, from Numptsch in the Dukedom Brieg in Silesia on 23 Jan, 1733. Gedeputeerden van Haarlem ter Dagvaart. 3.01.09. 1238 *National Archief*.

Engelhardt, for instance, submitted an application for “good and sufficient, God granted measures against the damaging sea worms” to the governors of Holland and Zeeland and later published that same application in pamphlet form.⁶⁶ His design called for a “sea wall” built using only iron and stone. An iron grate would be constructed which would then be filled with stone to protect the dikes.⁶⁷ (Figure 4.9) This design, Engelhardt argued, could replace sea dikes and dams and would be less costly by employing no masonry and incorporating recycled iron from anchors or bridges.

⁶⁶ The letter and pamphlet were both dated to 1733. Letter: *ibid.*; Pamphlet: Henricus Engelhardt, *Goede Suffisante, Gods Verleende, Uitgevondene Middelen, Omme Yzere, En Steene Zeemuuren, Met Paalen Zonder Metzelwerk, Tegens Het Schadelijke Zeegewormte Te Maken, Dewelke in Plaats Van Zeedyken, Dammen, En in De Zehavens Zoude Kunnen Dienen*, vol. 16913 ('s Gravenhage: Laurens Berkoske, 1733).

⁶⁷ *Goede Suffisante, Gods Verleende, Uitgevondene Middelen, Omme Yzere, En Steene Zeemuuren, Met Paalen Zonder Metzelwerk, Tegens Het Schadelijke Zeegewormte Te Maken, Dewelke in Plaats Van Zeedyken, Dammen, En in De Zehavens Zoude Kunnen Dienen* ('s Gravenhage: Laurens Berkoske, 1733), appendix 2.

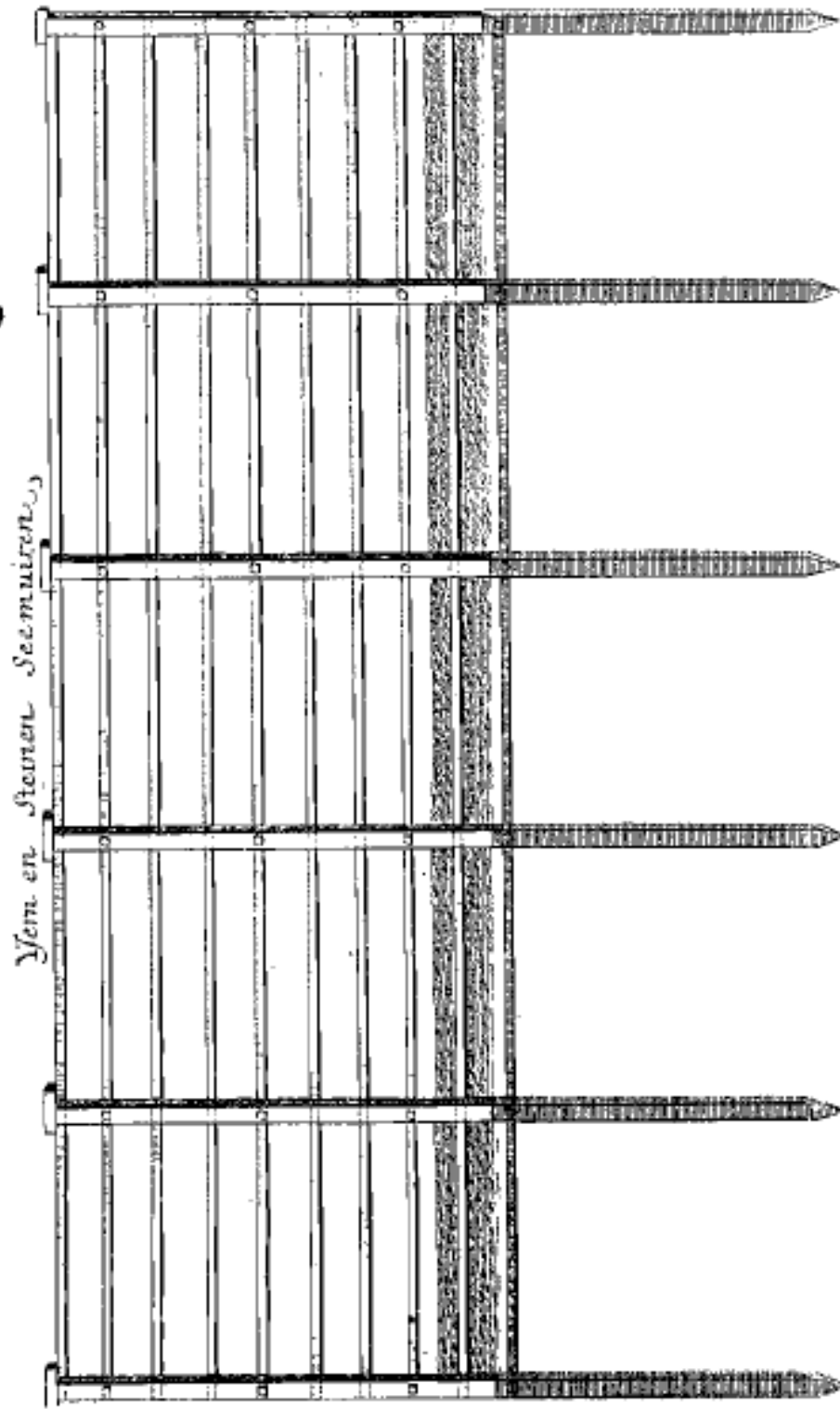


Figure 4.9 New design for a seawall. This image of a “sea wall” employing only iron and stone was an innovative answer to the shipworm threat because it was one of the few to completely reject the use of wood. It was ultimately deemed impractical, however. *Good, sound, God granted, invented measures to make an iron and stone sea wall, with piles without masonry against the destructive sea worms (Goede suffisante, gods verleende, uitgevondene Middelen, omme Yzere, en steene Zeemuuren, met Paalen zonder Metzelwerk, tegens het schadelijke Zeegewormte te maken, dewelke in plaats van Zeedyken, Dammen, en in de Zehavens zoude kunnen dienen)* ’s Gravenhage, 1733.

This flood of proposals did not go unanswered or untested. A set of experts commissioned by the *Staten van Holland* vetted the designs. The commission rejected some outright, either because they were too expensive or because they were too similar to earlier submissions. Many proposals mined the natural historical and engineering texts produced in response to the shipworm epidemic and grounded their proposals in their information. The committee rejected submissions that displayed an obvious ignorance of the biology of shipworms or water management. For instance, the commission rejected one suggestion from a “chevalier engineer of France” because he could not identify the right species of shipworm. The commission rejected another suggestion by J.C. Brunner because “the author showed not the least bit of knowledge about dikes or the worms.”⁶⁸

This trial period integrated the earlier institutional response with the more popular response of the 1732-34. It demonstrated the democratization of disaster response when institutional authorities opened up the dialogue of adaptation to the public outside of water management, a unique phenomenon in the context of flood disasters. It also demonstrated a broadly held optimistic belief in technological solutions to environmental problems. This willingness, not only of Dutchmen and foreigners to participate in an open marketplace for remedies, but also the provincial governors to look to unorthodox solutions was also an implicit acknowledgement that the technocratic understanding of the problem was limited, as were the pre-existing models for action. As novel as these circumstances were, they did not preclude the important (and very orthodox) role of a third level of interpretation and action of equal or perhaps greater importance: the role of religion.

⁶⁸ Gedeputeerden van Haarlem ter Dagvaart. 3.01.09. 1238 *National Archief*, 130.

Shipworm Responses: Divine Providence

Providential rhetoric affected nearly every response to the shipworm threat. The shipworms, according to this view, displayed God's displeasure with the Netherlands and portended future, more devastating disasters. Even the most mechanistic interpretations of the shipworm menace appealed to divine influence. Cornelis Belkmeer, for instance, began his *Natural Historical Treatment or Observation Concerning the Wood-grating or Boring Sea Worm* by affirming the worms' origin in God's "wonderful wisdom and unspeakable power" of creation, including animals as destructive and dangerous as the worms.⁶⁹ Providence was a useful interpretive framework on a number of levels. It explained the divine origins of the shipworm animal and its explosive arrival. The novelty and mystery of the worms underscored their conviction in the divine origins of the shipworm plague. Authors credited providence with facilitating secular solutions, and more often than not, they considered God's grace a remedy as powerful as any mundane solution. In other words, providence often worked in concert with mundane solutions. The providential interpretation of shipworm origins did not discount biological or ecological explanations. Indeed, oftentimes they reinforced them. These were not *ultimate* origins, however. The sinful condition of the Netherlands prompted the shipworm epidemic.

The specific sins responsible for the shipworm epidemic were wide ranging, but the crime of sodomy was a unique connection that highlighted the social significance of the origins dialogue. The shipworm epidemic coincided with an unusually high number of sodomy trials.

⁶⁹ Belkmeer, *Naturkundige Verhandeling of Waarneming, Betreffende Den Hout-Uytraspande En Doorbooren De Zee-Worm* (Amsterdam: J. Ratelband en Compagnie, 1733), 1. This was a classic example of Natural Theological reasoning.

Trials and executions for sodomy were rare in the seventeenth century, especially compared to other European countries.⁷⁰ During the period from 1730 to 1732, however, eighty-two men were sentenced to death in the United Provinces. The trials began in Utrecht before gravitating to Holland and focused primarily on the upper class. The trials reached their peak in the northern province of Groningen in 1731 where the provincial courts found one quarter of the accused guilty. The sodomy trials were, therefore, a national phenomenon that roughly coincided with the shipworm episode, but one with a regional character as well.

While the shipworm epidemic did not instigate the sodomy trials, it may have exacerbated them. As early as 1732, government and religious authorities already causally linked the two issues. For instance, one 1732 pamphlet whose anonymous author referred to himself as a “salvation seeking lover of truth,” identified several guilty parties responsible for the plague. The Netherlands, he argued, is full of all sorts of unwanted people such as robbers, thieves, murderers, and “lovers of sodoms sins.”⁷¹ Many ministers, in fact, likened the fate of Sodom and Gomorrah to the Netherlands. One pamphlet published in 1732 on behalf of the governors of

⁷⁰ They had a deep lineage in the Mediterranean region of being linked to disaster, for example, in Italy. See: Jussi Hanska, *Strategies of Sanity and Survival: Religious Responses to Natural Disasters in the Middle Ages* (Helsinki: Finnish Literature Society, 2002), 126. For more on this episode, see L.J. Boon, *Dien Godlosen Hoop Van Menschen: Vervolging Van Homoseksuelen in De Republiek in De Jaren Dertig Van De Achttiende Eeuw* (Amsterdam: De Bataafsche Leeuw, 1997). W.T. Vleer, *'Sterf Sodomieten!': Rudolf De Mepsche, De Homofielenvervolging, Het Faanse Zedenproces En De Massamoord Te Zuidhorn* (Norg: Veja, 1972). Theodorus Albertus Maria van der Meer, *"Sodoms Zaad in Nederland: Het Ontstaan Van Homoseksualiteit in De Vroegmoderne Tijd"* (Vrije Universiteit Amsterdam, 1995).

⁷¹ anon., *Opwekkende En Ziels-Lievende Uitnodiging Van Een Heilzoekende Lief-Hebber Der Waerheid [...] Tot Het Sien Van De Kragt Godts, in De Plage [...] Der Wormen Aen De Zee-Dyken*, vol. 16857 ('s Gravenhage: van Zanten, Cornelis, 1732), 3.

Holland warned of repeating the mistakes of the two cities.⁷² Johann Mobachius reiterated this assertion, and stated that the Netherlands must avoid the “unnatural and foul” sin that afflicted those cities as well as the ancient cities of Adama and Zeboim.⁷³ Moralists singled out sodomy as an unnatural and uncommon disease that warranted a similarly unnatural and uncommon affliction.

In keeping with the previous disasters of the eighteenth century, provincial institutions facilitated spiritual remedies. Just as during the cattle plague epidemic and the Christmas Flood, provinces declared days of thanks, fasting, and prayer. These solutions acted in tandem with mundane remedies. The *Staten van Holland*, for instance, issued a declaration of Thanks, Fasting, and Prayer on the 17 February 1733 in response to the many natural disasters of the previous few decades, but in particular, the “uncommon plague of destructive sea worms in the piles and woodwork.”⁷⁴ While the province of Holland did not treat days of thanks, fasting and prayer as mutually exclusive remedies for the shipworm threat, other provinces were more limiting. For instance, the Province of Friesland’s December 1732 prayer day acknowledged, “indeed, this terrible judgment of God has never been seen here, and regarding their origins and reproduction, these questions are so far beyond any human measure of ingenuity or cleverness,

⁷² *Het Bevel, Van De ... Heeren Staten, Gezonden Aan De Predikanten, in De Steede, Als Platte Lande, Om Te Waarschouwen, Het Sorgloos, En 'T Sondig Neederland; Tegen De Aanhoudende Bezoekinge Van De Verslindende Seeworme*, vol. 16855 (Amsterdam: A. v. Monnem, 1732).

⁷³ Johannes A. Mobachius, *De Almagtige En Regtveerdige Slaande Hand Gods, Ter Besoeking Van Het Land En Deese Provincie Met De Verderfelyke Plage Der Zeewormen, Vertoond En Aangedrongen Uit Nahum I: Vs. 3; Op Den Plegtelyken Vast-En Bid-Dag, Gehouden in De Provincie Van Groningen Ende Ommelanden, Den 8 Octob. 1732 ...; Al Waar Met Een Ingevoegt Is Een Beschrijving Van De Gedaante En Grootte Der Zeewormen, En Hoe Die De Dijkpalen Doorboren Nevens Een Afbeelding Daarvan* (Groningen: Jurjen Spandaw, 1733), 30.

⁷⁴ *Plakaat (17 Feb).* 1733. Archief van de Burgermeesters: publicaties van de Staten Generaal en van de Staten van Holland en West Friesland. 5022. 11. Stadsarchief Amsterdam.

much less can be found any remedy for this divine plague.”⁷⁵ Similarly, the Jewish chronicler from Amsterdam, David Franco Mendes, noted that most expert engineers “unanimously expressed their agreement that they did not know (a remedy against this plague), and at the same time, that they knew with certainty that it was a punishment from heaven and that human power was insufficient to fight against these tiny insects.”⁷⁶ While these exclusive providentialist appraisals of Dutch ingenuity were rare, they hearkened to similar pessimistic accounts seen in the wake of the Christmas Flood.

Ministers also played an active role in the providential narrative. This was partly because they performed the sermons and led their congregations in the governmentally sponsored days of prayer. If natural historians performed an investigative role concerning the natural origins and implications of the shipworm, ministers tasked themselves with determining the spiritual implications of the event with the same degree of rigor and scholarly acumen. The form of these pamphlets and books, however, followed earlier patterns established during the period of disaster. Ministers highlighted the relevance of cultural memory and biblical analogy. Harkenroht, for instance, cited every instance of “worms” as a punishment used in the bible. Worms and lice, he noted, were part of the plagues of Egypt. Worms also made appearance in the Book of Job, Matthew, and Psalms. Harkenroht also employed less familiar analogies, for instance focusing on Jonah 4:7.⁷⁷ This passage, he argued, had particular relevance for the disaster at hand. In this passage, God appointed a tree to grow over Jonah’s head that shielded

⁷⁵ J.S. van Wyckel, *Placcaat. Uitschryving Van Den Algemeenen Dank- Vast- En Beeden-Dag, Gehouden Binnen [...] Vriesland, Op Woensdag Den 3. September 1732* (’s Gravenhage: Zanten, Cornelis van, 1732), 5.

⁷⁶ Jan Willem Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)* (Zwolle: Waanders, 1992), 56.

⁷⁷ Harkenroht, *Worm in Nederlands Paalwerk Voor De Zeedyken*.

him from the wind and the sun, but then sent a worm to attack the tree exposing Jonah to the elements. The tree, in Harkenroht's interpretation, signified the bounty of the Netherland's natural wealth and God's providential favor. This interpretation once again hearkened back to an imagined, more prosperous past. The semiotics of this biblical analogy, substituting trees for wooden piles, is hard to ignore. Worms literally ate into the foundations of Dutch prosperity.

The worm sent by God to destroy the tree had familiar providential meaning. It expressed God's displeasure and served as a warning. "God imposes these punishments to wake the conscience," Harkenroht argued.⁷⁸ The worm analogy also had unique implications not seen in earlier disasters. The worm demonstrated God's power; a power evident in even His smallest creatures. Unlike flood disasters or the cattle plague epidemic, contemporaries acknowledged shipworms as a visible, biotic threat. These analogies demonstrated the flexibility of providential interpretations to accommodate new threats and the subtle changes those threats inspired in venerable notions of divine retribution.

⁷⁸ Ibid., 5.

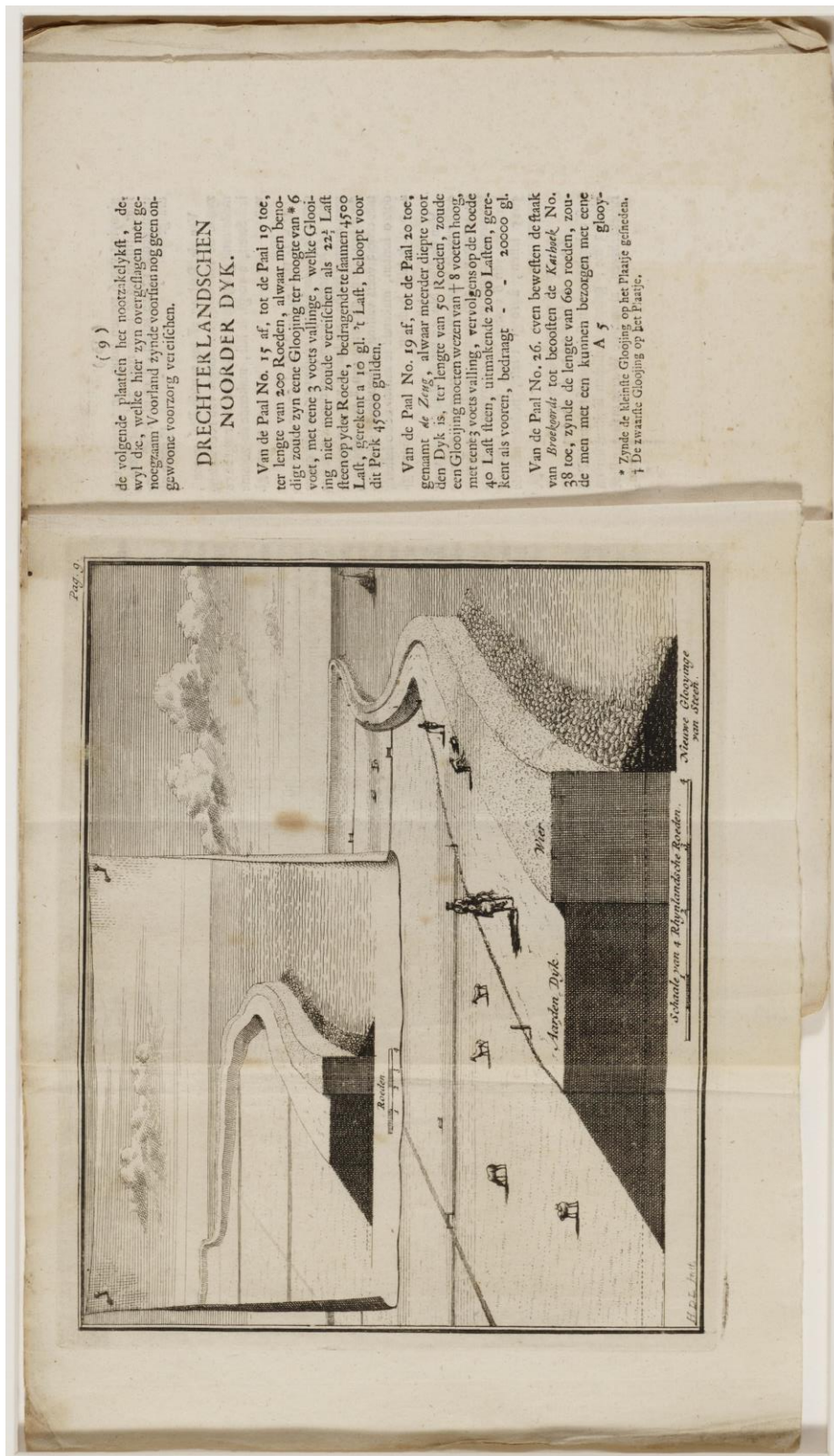


Figure 4.10 New Drechterland Dike Design. Straat and Van der Deure's design was notable for its use of stone laid on a gentle gradient along the seaward side of the coastal dikes. These designs included the use of *wier*, showing one more instance of the power of tradition. From: Pieter Straat and Pieter van der Deure. *Design of a least costly, sure, and quick repair of the Worrisome situation of the West Frisian Sea Dikes (Ontwerp tot een minst kostbaare zeekerste en schielykste herstelling van de zorgelyke toestand der westfriesche zeedyken....)* 1735, 9. Courtesy of Zuiderzeemuseum Enkhuizen.

The institutional, natural historical and providential frames were each well developed by 1733 when the commission implemented by the *Staten van Holland* decided to implement the design proposed by Pieter Straat and Pieter van der Deure. No extant sources explain the commission's motivation for choosing this design. Straat and Van der Deure's pamphlet notes that they performed a trial of their design near the West Frisian town of Enkhuizen, perhaps indicating that a similar provincial committee vetted their designs as they did others.⁷⁹ In the absence of a smoking gun, Straat and van der Deure's use of language assumes an elevated importance. Their design drew upon rhetoric from each of these frames discussed above. It was a mechanical solution clothed in populist rhetoric dating back to the initial 1732 *Mercurius* article of being the "least expensive, quickest, and most certain" plan for the repair of the West Frisian dikes.⁸⁰ Its rhetoric tapped into the growing institutional desire for novel solutions identified by Seger Lakenman as early as 1732 and exemplified by the flood of innovative designs sent to the *Staten* in the wake of the *Mercurius* article. In the introduction to their plan, Straat and Van der Deure argued that they presented "a new manner of dike building that has never been practiced before, namely, to bring boulders and stony cliff rocks to the dike and to lay them on the seaward slope of the dike."⁸¹

They also tapped into the fear of inundation should their designs not be implemented. Just as Lakenman and others warned of dike breaches that could penetrate the "fortress" of the

⁷⁹ Straat and van der Deure, *Ontwerp Tot Een Minst Kostbaare Zeekerste En Schielykste Herstelling Van De Zorgelyke Toestand Der Westfriesche Zeedyken... Met Een Nader Ontwerp Hoe Men De Dyken Daar De Grootste Dieptens Zyn Op De Zekerste, Minst Kostbaarste En Schielykste Wyze Kan Herstellen... Door Pieter Straat En Pieter Van Der Deure* (Amsterdam: J. Oosterwyk, 1733), 6-7.

⁸⁰ Ibid.

⁸¹ Ibid., 6. This use of falsely innovative rhetoric was similar to Thomas van Seeratt's claim to novelty following the Christmas Flood.

Omringdijk with implications throughout North and South Holland, Straat and Van der Deure painted a picture of a storm turning the area between the cities of Haarlem, Leiden, and Amsterdam into "its own sea."⁸² They accentuated this sense of risk by acknowledging the providential and patriotic implications of the threat, calling on "the help of heaven to prevent dike breaches and protect the welfare and salvation of our beloved fatherland."⁸³ Straat and Van der Deure's designs, therefore, were part of an existing dialogue and their ultimate success was dependent upon their mastery of several elements of shipworm response. As large a transition in dike building as their design certainly inspired, multiple pre-existing dialogues grounded its success. Even their designs were not entirely the "new manner of dike building" they advertised. Dutch dike engineer Andries Vierlingh had already suggested sloping, stone-layered dikes in the sixteenth century and Gottfried Sellius made a similar assertion in response to the shipworm epidemic.⁸⁴ Recent archeological evidence also indicates that West Frisian dikes employed recycled brick from nearby towns in similar manner since at least the seventeenth century.⁸⁵ Thus, just as Thomas van Seeratt used the rhetoric of "improvement" following the Christmas Flood, Straat and Van der Deure likewise capitalized on the technocratic rhetoric of innovation.

Their successful navigation of the prevailing dialogues of response and their own use of improvement notwithstanding, provinces and water authorities did not immediately (nor universally) implement Straat and Van der Deure's designs. One explanation was their plan called for extensive importation of stone into Holland. This required the development of

⁸² Ibid., 29.

⁸³ Ibid., 6.

⁸⁴ Harm Pieters, "Metamorfose: Van Hout Naar Steen," *Historisch Tijdschrift Holland* 42, no. 3 (2010), 273.

⁸⁵ Michiel H. Bartels, "Zeven Keer Door De Zuiderdijk," *West-Friesland Oud & Nieuw* 78(2011): 69-77. "De Spuiter Uit 1659, Een Archeologisch Onderzoek," *West Friesland: Oud en Nieuw* (2012): 71-92.

transportation networks to haul the stones and regulation to ensure quality, both of which were costly changes. Stone was expensive, especially when imported from Scandinavia, so only the most at-risk areas without *voorland* warranted quickly adaptation.⁸⁶ The use of stone could be considered a novel design element, but a more accurate conclusion is that Straat and Van der Deure merely tapped into a pre-existing awareness of its effectiveness. Prior to the shipworm epidemic, intensive use of stone was cost-prohibitive. Only the arrival of the shipworm tipped the cost-benefit relationship in favor of its use. The cost of this transition was enormous and played a sizeable role in the economic difficulties of West Friesland for decades. At least initially, the Dutch were uncertain how expensive the shipworm repairs would be. The emphasis on determining the “least costly” means of eradicating the mollusks was likely more than simply pragmatism. It was a necessary precondition considering the dire economic condition of the United Provinces. This may also help explain why Holland took the unprecedented step of seeking novel (and more cost effective) solutions outside the usual channels of water management.

Also, some provinces chose (at least initially) other adaptive paths. Zeeland, for instance, flirted with the idea of sheathing wooden piles in metal. Friesland only began importing stone (on the recommendation of Holland) over a year after their own decision to do so in 1733. Even Holland initially opted for a different solution and decided upon Straat and Van der Deure’s

⁸⁶ Initially, stone was imported from the Drenthe to the east as well as from Scandinavia. Stone sellers initially pillaged the megalithic prehistoric settlements of Drenthe for their stones. This prompted a law already in 1734 against the taking of stones from these hunebeds. This was the third law in the world to protect antiquities. J.A. Bakker, *Megalithic Research in the Netherlands, 1547-1911: From "Giant's Beds" and "Pillars of Hercules" to Accurate Investigations* (Sidestone Press, 2010), 62. Over the course of seventy years, 1.2 million tons of stone were imported into West Friesland. Johannes Jouke Schilstra, *In De Ban Van De Dijk: De Westfriese Omringdijk* (Hoorn: West-Friesland, 1982), 85.

plans only after their own reconstructions failed to withstand the erosive impact of the sea.⁸⁷

These designs should not be interpreted in a vacuum, however. They were responsive to a number of rhetorical and economic considerations with venerable traditions (providentialism, engineering with stone) or recently developed (natural historical and popular responses).

An Uncommon Disaster?

The response to the shipworm epidemic had much in common with previous disasters, but it was widely considered an exceptional event in the eighteenth-century Netherlands. It inspired many unique responses from natural historians, ministers, and water managers. The religious connection between shipworms and sodomy, for instance, was a distinctive cultural relationship to the 1730s. While both had discrete and separate origins, they achieved cultural relevance because of their simultaneity. The same was true of the shipworm epidemic in the context of the other disasters of the eighteenth century. The cattle plague epidemic, the Christmas Flood of 1717, and the shipworm threat occurred during a period of secular depression in the Netherlands and an era of deep soul searching about the future prosperity of the Dutch Republic. The context of these events, in other words, partly dictated Dutch response.

The cultural, technological, and economic reactions to these events were also distinct and it is worth considering why this disaster, as opposed to the many other disasters preceding and succeeding it, warranted such unique reactions. This analysis provides insight into the role of historical context, culture, and the memory on the technological innovation and adaptive decision-making. Contemporaries recognized the special nature of this disaster. The rich

⁸⁷ Other regions of Holland adapted the stone slope design later, following a different institutional path to acceptance. The province approved stone improvements to the Diemerdijk near Amsterdam in 1734. These plans were based on successful trials of the design in West Friesland. Fransen, *Dijk onder Spanning*, 216-217.

outpouring of literature on the origins of the animal from natural historians is one obvious indication. Institutional and providential sources were more direct. “Who has seen a stranger plague,” the anonymous author of the 1732 pamphlet “The Netherlands Exhorted to Penitence” (*Nederlandt aengemaent tot boetvaerdigheid*) asked, this being such “a rare pest, from God's vengeful hand.”⁸⁸ The language used to describe the shipworms is perhaps the most obvious indication. A placard declaring a day of Fasting, Thanks, and Prayer in Friesland, for instance, referred to the “very destructive, uncommon, sort of sea worm.”⁸⁹ Johannes Kemner, in his providential treatment, referred to them as “unrecognized sea monsters.”⁹⁰ Almost every document refers to the shipworms or the epidemic nature of the threat as “strange,” “uncommon,” “unexpected,” or “previously unknown.” Commentators referenced not only the strangeness of the animal, but also the unusual character of its effects. Harkenroht, for instance, noted, “this is certainly an uncommon affliction because I have never read of a similar plague of sea worms in the pileworks.”⁹¹ This characterization of the shipworms as an alien species was an important element of the providential interpretation because it gave greater credence to the supernatural origins of the worms.⁹²

The novelty of the shipworms was also important from a practical perspective. While Dutch mariners and natural historians were aware of shipworms and their effects in a limited capacity, Dutch water managers could not capitalize on prior experience or traditions of

⁸⁸ Anon., *Nederlandt Aengemaent Tot Boetvaerdigheid* ('s Gravenhage: G. Block, 1732), 3.

⁸⁹ J.S. van Wyckel, *Placcaat. Uitschryving Van Den Algemeenen Dank- Vast- En Beeden-Dag, Gehouden Binnen [...] Vriesland, Op Woensdag Den 3. September 1732* ('s Gravenhage: C. van Zanten, 1732), 4.

⁹⁰ Kemner, *Monstreuse Zeewurm Doorknagende Het Posten Paalwerk in De Provincie Van Stadt En Lande En Wel Voornamentlyk in De Nabuirige Provincie Van Vriesland in Het Jaar 1732* (Groningen: Pieter Bandsma, 1732), 4.

⁹¹ Harkenroht, *Worm in Nederlands Paalwerk Voor De Zeedyken*, 57.

⁹² Unnatural sometimes referred to God suspending the ordinary working of the nature, “General Providence” by divine fiat “special providence.”

response. There had never been an epidemic of shipworms in Dutch dikes and the worms themselves were mysterious. In their second report on the dikes, for instance, the *heemraden* and dike reeves (*dijkgraven*) of the *Noorder Koogen* water board in West Friesland acknowledged that their dikes were “gnawed” by a “certainly unknown sort of Worm.”⁹³ This admission of ignorance could have been a rhetorical strategy to remove themselves from charges of inaction, but it may also have been the truth. At the very least, the scale of the threat was unprecedented.

Perhaps the most critical difference between shipworms and other disasters, however, was that shipworms were only a potential threat, not an active disaster yielding loss of life or property. Unlike the disastrous floods or the cattle plague epidemic of the early eighteenth century, commentators could not tally the dead or list losses of property. Commentators, instead, portrayed the shipworms as vessels of divine judgment. They were also vehicles for a much more familiar threat: flooding. Johannes Kemner, for instance, described the worms’ weaponry as “wind, tempest, and the danger of storms.”⁹⁴ The anonymous author of *Nederlandt aengemaendt to boetvaardigheit* explained that these “uncommon pests” threatened to unleash the “violence of an unshackled sea.”⁹⁵ Shipworms were frightening, not only because of their novelty, but because they exposed the Netherlands to one of its deepest and most familiar cultural anxieties: the fear of flooding. This synthesis of unknown assailant with known consequences was a potent combination.

⁹³ *Beschryvinge, Van De Schade En Raseringe Aan De Zee-Dyken Van Noort-Hollanden West-Vriesland, Door De Worm in De Palen, En De Daar Op Gevolgde Storm, En Vervolgens: Waar by Komt Een Beschryving Van Een Nieuwe Water-Machine* (Hoorn: Jacob Duyn, 1732), 9.

⁹⁴ Kemner, *Monstreuse Zeewurm Doorknagende Het Posten Paalwerk in De Provincie Van Stadt En Lande En Wel Voornamentlyk in De Nabuirige Provincie Van Vriesland in Het Jaar 1732* (Groningen: Pieter Bandsma, 1732), 4.

⁹⁵ Anon., *Nederlant Aengemaent Tot Boetvaardigheit*, 3.

The shipworms were uncommon and the scale of their effects was exceptional, but they were also unexpected. In the context of an ongoing secular depression and changing position of the United Provinces in the European balance of trade, this additional threat came as a shock to onlookers. Harkenroht, for instance, noted, “The lessening of commerce, the ongoing bad times that are a great disadvantage,” but the sudden and “unexpected new plague of sea worms” was traumatic.⁹⁶ The unknown nature of the threat was a shock that only compounded the economic difficulties of the eighteenth-century and accentuated the fear of the declining state of the Netherlands.

The reactions to the shipworm threat were also somewhat unique. From a cultural perspective, shipworms dominated print production (especially pamphlets) in a manner seen only with the major catastrophes of the eighteenth century. It was only comparable to the cattle plague epidemic, the floods of the 1740s, and the Christmas Flood of 1717. (Figure 4.11)

⁹⁶ Harkenroht, *Worm in Nederlands Paalwerk Voor De Zeedyken*, 12.

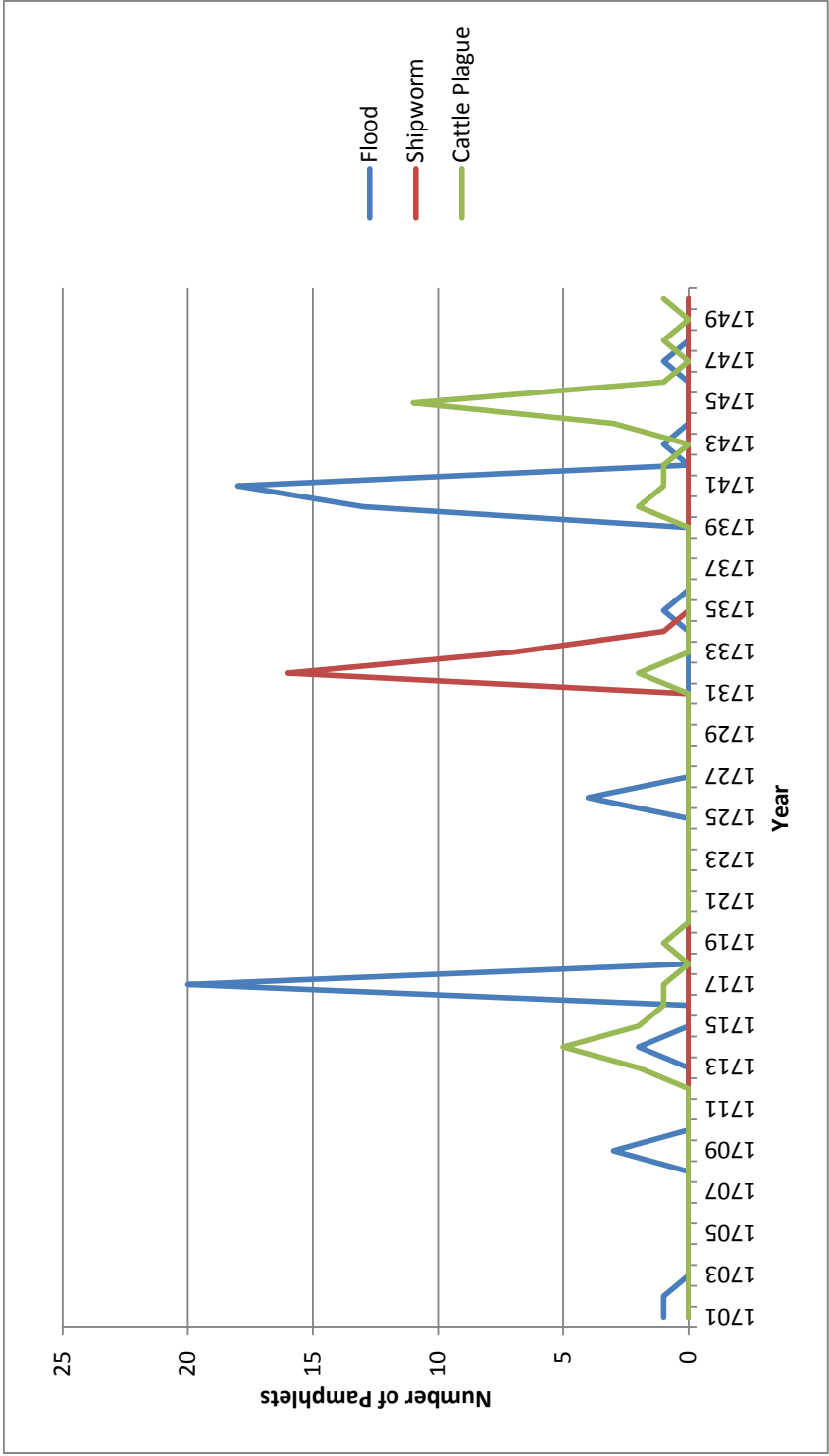


Figure 4.11 Pamphlet production by disaster, 1701-1749

Crucial differences existed between even these major disasters and the shipworm epidemic as well. Provincial institutions and water management boards made no attempt during the Christmas Flood to incorporate non-professional opinions (and much more than the cattle plague). This willingness by authorities to acknowledge a lack of expertise was a critical difference that set the shipworm epidemic apart. The anxiety displayed in contemporary literature was also qualitatively different. The shipworm threat, although limited to the coastal Netherlands, received national attention and pamphleteers in particular addressed their concerns to the “Fatherland.” The sodomy trials were another example of the unique cultural response to shipworms. Lastly, neither the cattle plague nor the Christmas Flood instigated an adaptive response to the degree of the shipworm episode. Few floods in Dutch history could match the geographic scope of the shipworm epidemic, and although cattle plague had a more widespread impact, disease management depended upon interpretations of animal medicine extended back centuries in the past.

What accounted for the disparity between the measured responses to most disasters and the more catalytic response to shipworms? Memory and history offer crucial explanations. Unlike cattle plague, flooding, or other disasters, shipworms were not in the catalogue of clear and present dangers housed in the deep cultural memory of the Netherlands. Contemporaries could not easily draw on centuries of dike experience to deal with this threat; they could not find a shipworm threat to this extent in their history using the same cultural explanations. One of the most powerful indications that memory and history held explanatory power was the effort contemporaries made to place the shipworm disaster in an understandable historical frame. Natural historians and spiritual leaders catalogued the (albeit limited) evidence of previous shipworm sightings. The epidemic character of the Dutch shipworm outbreak precluded any easy

comparisons, however. A far more common tendency was to position the shipworm epidemic in the context of other disasters.

Shipworms in the Period of Disaster

The shipworm epidemic was the third major disaster of the eighteenth century. It occurred within a generation of the first cattle plague epidemic (1714-20) and the Christmas Flood of 1717. The proximity between these traumatic events made it possible for some commentators to provide explanations of all these events. Jacob Harkenroht, for instance, wrote on the cattle plague, the Christmas Flood and the shipworm epidemic.⁹⁷ With every new disaster, Harkenroht connected them together in a gradually lengthening causal chain of providential meaning.⁹⁸ Johannes Kemner also evaluated multiple disasters.⁹⁹ His 1732 pamphlet on the shipworm epidemic, entitled *Monstreuse Zeeworm*, connected each of these disasters together, relating them to a providential interpretation of shipworm origins. The Netherlands, he asserted, should “tread in the footsteps of God’s grace” or He will send the “sword of war, rinderpest...or floods.”¹⁰⁰

Most commentators who linked the disasters, however, did so during the 1730s within the immediate context of the shipworm event. Just as writers documenting the Christmas Flood

⁹⁷ Jacobus Isebrandi Harkenroht and Gerardus Outhof, *Kerkreede over Oostfrieslands Rundvees Pest ... Aan De Gemeente Te Larrelt in Oostfriesland* (Emden: Enoch Brantgum, 1716); J.I. Harkenroht, *Kerkrede over Oostfrieslands Kerstvloed Den 25 December Des Jaars 1717 ... Op Den Eersten Zondag Des Jaars 1718, Den 2 Januaris Aan De Gemeente Te Larrelt Aan Den Eems in Ostfriesland, Nevens Een Kort Ontwerp Van Deezen Laasten Kersvloed 1717* (Emden: by H. van Senden, 1721); Harkenroht, *Worm in Nederlands Paalwerk Voor De Zeedyken*.
⁹⁸ *Worm in Nederlands Paalwerk Voor De Zeedyken*, 10.

⁹⁹ J. Kemner, *De Suchtende Landtman in De Provincie Van Stadt Groningen En Ommelanden over De Hooge Water-Vloedt Op Kers-Tydt Den 25. Van Winter-Maandt in Het Jaar Onses Heeren 1717* (Groningen: Johannes van Velsen, 1718); *Monstreuse Zeewurm Doorknagende Het Posten Paalwerk in De Provincie Van Stadt En Lande En Wel Voornamentlyk in De Nabuirige Provincie Van Vriesland in Het Jaar 1732* (Groningen: Pieter Bandsma, 1732).

¹⁰⁰ *Monstreuse Zeewurm Doorknagende Het Posten Paalwerk in De Provincie Van Stadt En Lande En Wel Voornamentlyk in De Nabuirige Provincie Van Vriesland in Het Jaar 1732* (Groningen: Pieter Bandsma, 1732), 10.

sometimes referenced earlier floods, pestilence, or the ongoing cattle plague, shipworm accounts placed the invasion in the context of disasters occurring since the *rampjaar*. Nearly all of these accounts were providentialist. “In the past I was not once, but many times, beset by God’s disasters,” the anonymous Frisian author of “Dutch Complaint over Gods Imminent Punishments” (*Nederlands Klachte over Gods Naekende Oordelen*) explained. “My fattened lands,” he continued, were “engulfed and set into the naked sea [and] a fire, the inextinguishable fire of plague, violated my pastures and struck my guiltless cattle.”¹⁰¹ Owners did not share the “guiltless” state of afflicted cattle. Indeed, sin connected these disasters together into a unified period of disaster. The cultural anxiety that underpinned this causal story reflected the increasing awareness of the Netherlands’ diminishing prosperity.

Provincial institutions conveyed these sentiments perhaps more consistently than even religious authorities did. In their instructions for governmentally sponsored days of fasting, thanks, and prayer, the provinces often linked war, natural disaster, and economic hardship together. Even the *Staten Generaal* of the Netherlands decreed a day of Thanks, Fasting, and Prayer in March 1733. These documents confirmed, not only the providential nature of the affliction, but the connections between shipworms and other disasters. It argued that “God’s striking hand” (*slaande hand*), an expression widely employed during the first cattle plague epidemic, was again evident in the “lessening of navigation and commerce, through storm floods, the uncommon sicknesses among men and beasts, and lastly through an unusual plague of

¹⁰¹ R.B., *Nederlands Klachte over Gods Naekende Oordeelen : Duidelyk Te Bespeuren in Het Knaegen Der Wormen Aen De Paelen Der Nederlandze Zeedyken : Ter Gelegenheid Van Den Dank, Vast- En Bededag, Uitgeschreven by De Heeren Staeten Van Vriesland, Tegens Woensdag Den 3en Van Herfstmaend Des Jaers 1732* (Harlingen: Folkert Jansz van der Plaetz, 1732), 4-5.

destructive worms in the piles and woodwork.”¹⁰² Each of these disasters contributed to the decline of the Netherlands and all linked to human sin.

The placement of the shipworm epidemic in a continuum of disaster, therefore, highlighted the power of providential interpretations and the importance of memory as an explanatory framework. Commentators unified disastrous events from the past into overarching periods of disaster in order to reinforce existing providential rhetoric, but also to make the unusual explainable. In doing so, contemporaries could prescribe a providential remedy for the shipworm affliction. Provincial (and even national) prayer days were the most public form of this disaster response.

Conclusion

While the traditional shipworms narrative favors a techno-centric approach with a discrete, revolutionary outcome, the process of disaster response was more complicated. It certainly featured dike engineers and provincial authorities, but also scholars, ministers, and laypeople. These dialogues of response influenced Straat and Van der Deure’s designs. This chapter also demonstrated that these voices were significant, not only in the redesign of dikes, but also as an illuminating example of the role of novelty, memory, and a changing environment in shaping disaster response. Dutch cultural response to this threat was exceptional, but that characterization is only justified if one compares the shipworm episode to other, more common disasters, such as floods and plagues. From a cultural perspective, the shipworms inspired a level of anxiety seldom seen in the eighteenth century. This anxiety was most evident in the degree of

¹⁰² Nicholaas Christiaan Kist, *Neêrland's Bededagen En Biddagsbrieven: Een Bijdrage Ter Opbouwing Der Geschiedenis Van Staat En Kerk in Nederland. De Nederlandsche Biddagsbrieven* (Leiden: S. en J. Luchtmans, 1849), 327.

public interest and involvement. On the other hand, the public directed their response through pre-existing pathways. Dutch moralists may have tailored their providential arguments to the worms, but they approached the threat from a fundamentally similar angle. The worms, much like cattle plague and floods, displayed God's displeasure.

From the perspective of water management, shipworms catalyzed widespread redevelopment of dike designs. This is a surprising outcome considering (or perhaps because) the omnipresent threat of flooding rarely inspired the same reaction. One might expect that floods, especially large floods, would prompt design reevaluations or innovative approaches to management. The case of the Christmas Flood demonstrated that flood disasters occasionally prompted these changes, but they often worked in concert with new fiscal or political realities. These changes occurred over the long term, so it is difficult to identify floods as discrete catalysts of change. Ironically, the shipworm epidemic was slow onset when compared to the sudden breach of a dike. Perhaps because large floods were relatively unpredictable and the shipworm episode was a tangible portent of future disaster, the latter prompted more immediate response.

It is also difficult to identify the catalytic role of floods because responses were general and ongoing. Dike adaptation usually involved enlarging the dike body, levelling the slope, or reinforcing the seaward side of the dike. Flood risk was ever-present, so whether dike adaptation occurred in response to one flood or another, the only rubric for historians to determine the "responsible" disaster is its proximity to the dike redevelopment. Shipworm response, on the other hand, was unique to one threat rather than broadly attributable to repeated, ever-present conditions. Historians are uniquely able to address the consequences of these mollusks because the technological response was so specific to this threat.

On the other hand, one can easily identify broad similarities between flood disasters and the shipworm disaster. Water technocrats employed variations on existing models of dikes, some reaching as far back as the sixteenth century. Institutional actors chose measured responses and focused much of their attention on pragmatic considerations such as financing and repair. Contemporaries interpreted shipworms, at least initially, as manifestations of flooding threat and their response was similar to that which was common when a dike was determined to be vulnerable. The context of repeated disasters affected each of these responses. This was partly for pragmatic reasons. The economic recession and the fallout from the cattle plague epidemic and repeated flooding limited options for financing repairs. This context of disaster also prompted their appeal to cultural memory and providence as tools to integrate a “previously unknown” disaster into a useful frame of reference. From this perspective, shipworms easily fit into the period of disaster.

Chapter 5. God's Striking Hand: Change and Continuity during the Second Cattle Plague Epidemic

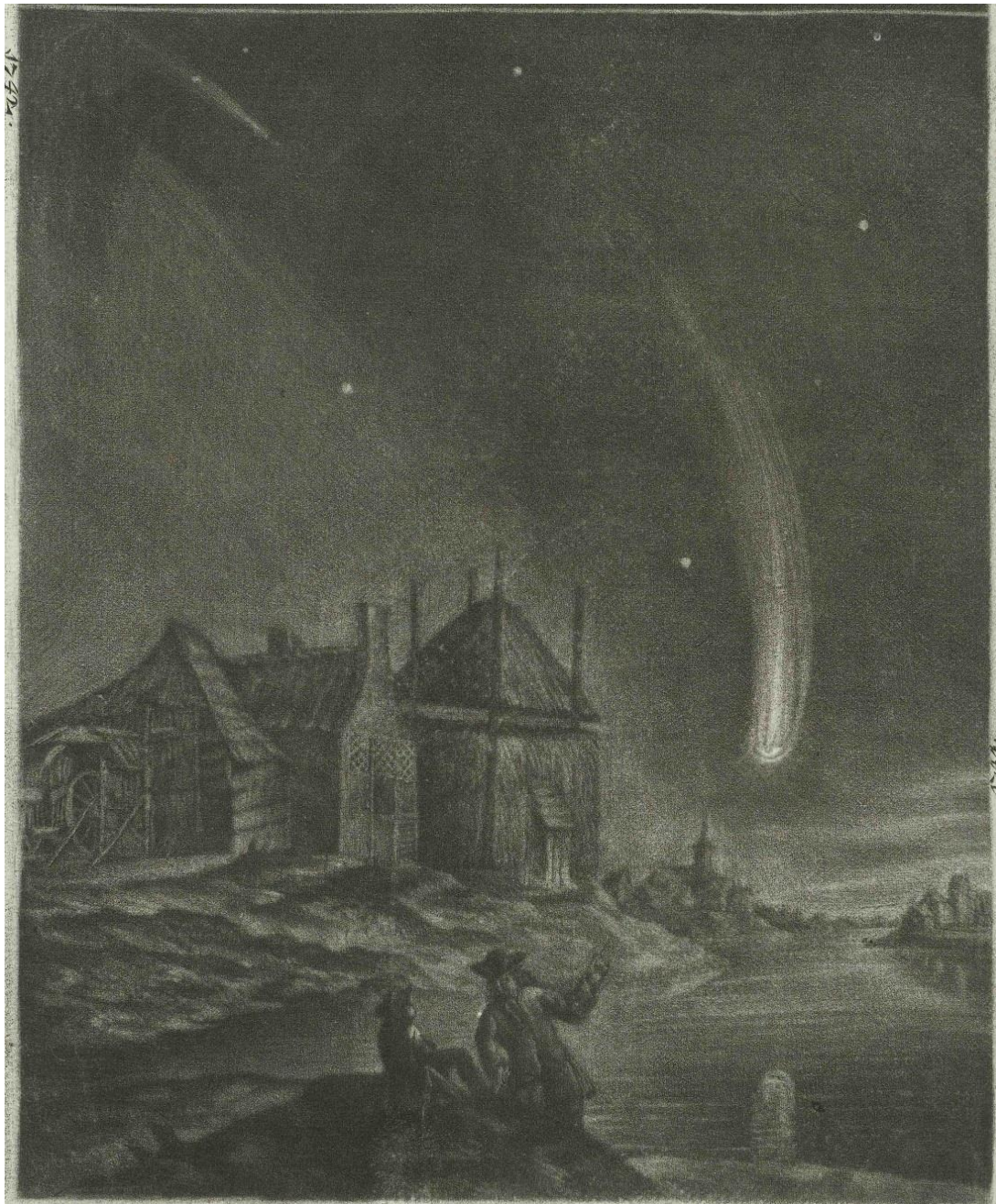


Figure 5.1 *Depiction of the Meteors that appeared in 1742 and 1744 (Afbeelding van de Staartsterren, verscheenen in de jaaren 1742 en 1744)*, Jan de Groot, 1744. Early modern observers commonly interpreted meteors as divine, oftentimes ominous, portents. This image depicts the meteor of 1744 which appeared shortly before the re-arrival of cattle plague in the Netherlands.

For many of the Dutch who had weathered the previous decades of dearth, death, and disaster, the year 1744 began under an ominous star. First appearing in 1743 in the telescopes of two Dutch astronomers, an incredibly bright comet with six tails blazed across the sky and continued to astonish onlookers into the spring of 1744.¹ (Figure 5.1) Observers across Europe, from Swiss astronomers to Dutch cattle farmers, witnessed and recorded this astronomical event. The interpretation of comets and other prodigies had a venerable tradition in Europe, primarily because they were thought to offer insight into divine agency. By the mid-eighteenth century, comets still engendered both fear and wonder in the Netherlands and many Dutch observers kept active records of their passing.² In the Utrecht town of Woerden, for instance, the Catholic priest Godfridus Ram included the 1743-1744 comet in his *doopboek* (baptismal book), noting his impressions about its appearance and its degree of visibility for much of January.³ Curiosity and wonder about these celestial visitors were certainly widespread responses in northern Europe

¹ Referred to as the “Great Comet of 1744” or the Comet Klinkenberg-Chéseaux, this comet was independently discovered by two Dutch astronomers, Jan de Munck and Dirk Klinkenberg, as well as Swiss astronomer Jean-Philippe Loys de Chéseaux. De Munck and Chéseaux each published their findings. Jan de Munck, *Sterrekundige Waarneemingen Op De Comeet of Staart-Sterre Sedert Den 29 November ... 1743 Tot Op Den 1 Maart ... 1744* (1744). Jean-Philippe Loys de Chéseaux, *Traité De La Comète Qui a Paru En Décembre 1743 & En Janvier, Février & Mars 1744: Contenant Outre Les Observations De L'auteur, Celles Qui Ont Été Faites À Paris Par Mr. Cassini & À Geneve Par Mr. Calandrini : On Y a Joint Diverses Observations & Dissertations Astronomiques, Le Tout Accompagné De Figures En Taille Douce* (Lausanne: Chez Marc-Michel Bousquet & Compagnie, 1744).

² Erik Jorink argues that by the eighteenth century, a once monolithic interpretation of comets as fearful portents had ceded ground to an assurgent natural theological perspective which interpreted comets as wonders revealing God's power. Eric Jorink, *Reading the Book of Nature in the Dutch Golden Age, 1575-1715*, trans. Peter Mason (Leiden: Brill, 2010), 109-179.

³ Godefridus Ram. *Doopboek of Godefridus Ram*. c. 1782. DTB Registers Montfoort. M084. 564. RHC Rijnstreek en Lopikerwaard.

during the period and many observers wrote detailed descriptions of comets and other “meteors” in their diaries, journals, and correspondence.⁴

Perhaps because of the recent history of disastrous events, however, this particular comet inspired many to interpret it as a signal portending further trials. In his 1744 physico-theological treatise *The Inhabitants of the Earth encouraged to a proper fear of Gods Signs...in particular of the Comets*, Hendrik van Barn-in ‘t-Loo argued that the comet signaled God’s displeasure and that the earlier episode of cattle plague, the Christmas Flood of 1717, and the shipworm epidemic were further confirmation of his anger. “Surely,” he argued, “it is a sign of God’s holy displeasure over a land and a people when He begins to burn his fire everywhere.”⁵ Van Barn-in ‘t-Loo’s interpretation of this astronomical phenomenon as a sign of future disasters was broadly shared in the Netherlands.⁶ Looking back in retrospection about the years following the portent, one observer in the Holland town of Zaandam noted that the comet was “a woeful sign of the plague that God Almighty brought thereafter.”⁷ Indeed, the next two decades would seem to justify these interpretations.

The year 1744 and 1745 were the nadir of this post-Golden Age period of disaster. The combined economic stresses of past plagues, the shipworm epidemic, wars, floods, and other

⁴ Vladimir Janković has made a detailed analysis of this tendency in England in Vladimir Janković, *Reading the Skies: A Cultural History of English Weather, 1650-1820* (Chicago: University of Chicago Press, 2000). In the Netherlands, see Jorink, *Reading the Book of Nature in the Dutch Golden Age, 1575-1715*.

⁵ Hendrik van Barn in 't Loo, *De Inwoonders Der Aarde Aangespoort Tot Een Betamelyke Vreze Voor Gods Tekenzen, in En Aan Den Hemel: Handelende Van De Hemel-Ligten in 'T Gemeen, Als Luidbare Verkondigers Van Gods Volmaaktheden, Maar in 'T Byzonder Van De Comeeten* (Leiden: Johannes Hasebroek, 1744), 4-5.

⁶ Cornelis Huisman argues that Barn-in ‘t Loo, similarly to Bernard Nieuwentijdt, reflected a new and popularly regarded form of physic-theology. Cornelis Huisman, *Neerlands Israël: Het Natiebesef Der Traditioneel-Gereformeerden in De Achttiende Eeuw* (Dordrecht: J. P. van den Tol, 1983), 37.

⁷ Simon Jacobsz. (?) Kraamer. *Eenijge Merckwaerdige Gebeurttenisse, Voorgevalle Bij Mijn Tijdt. c. 1752*. Doopsgezinde Gemeente Zaandam-West. KA 0012. 39.IV. Gemeentearchief Zaanstad.

disasters were far from resolved when the second outbreak of cattle plague hit the Netherlands in 1744. This second epidemic was the most expensive nature-induced disaster of the eighteenth century. As opposed to the Christmas Flood or the shipworm epidemic whose effects primarily affected the coasts, the cattle plague hit every province in the Netherlands. In this respect, it was similar to the first cattle plague epidemic, but on every other scale, the second outbreak dwarfed the first. The reappearance of the plague also could not have come at a worse moment for many in the Netherlands. The five years immediately preceding the outbreak had been marked by a wave of other disasters, nature-induced and otherwise. Severe winter temperatures killed crops, animals, and people; rivers topped their dikes, overwhelmed villages, and inundated fields; and waves of mice infestations starved livestock of what fodder remained after the floods and frosts. These environmental and economic conditions created an ideal moment for the introduction of disease.

Just as during the first episode of cattle plague, the Dutch were well aware of its approach before it arrived. Newspaper accounts across the Netherlands gave frequent updates on the advance of the disease across Europe.⁸ Remembering the onset of the previous epidemic, the vulnerable rural population nervously watched neighboring lands and provinces as the disease inched closer and finally crossed the border into the Netherlands. The disease seemed to come from two directions. In the south, an invading French army had brought the disease into what is now Belgium by the summer of 1744. In the North, the disease first appeared in the fall of 1744 in North Holland and reached epidemic proportions following the cattle market in Hoorn in late

⁸ For instance, over the course of 1746, the 's Gravenhaegse Courant followed the apparent end of a cattle plague episode in Russia only to see it spread across Poland into central Europe. See: 18 Feb. 1746. 14 Sep. 1746. 14 Nov. 1746.

fall.⁹ The Delft farmer Paulus van der Spek noted with trepidation in his diary in 1744 that the plague was already in France and also North Holland, and that by the “21st of November, I heard say from Pieter Melief who lives between The Hague and Scheveningen that one animal was already dead.”¹⁰ The disease spread slowly and unevenly, but spared very few regions of the Netherlands. By the late spring of 1745, Van der Spek noted, “it was a wonder to find one farmer who had not lost his animals.”¹¹ His characterization of the scope and seriousness of the epidemic was representative of many Dutch observers as the disease persisted and spread. Between 1744 and 1764, cattle plague killed over one million cattle in the Netherlands.¹²

This chapter highlights the changing face of disaster in the Netherlands between 1744 and 1764—easily the most trying time for the general region since the disastrous period between 1672 and 1675. Variety and severity characterize the entire post Golden Age era of disaster. This second cattle plague epidemic, however, offers a unique chance for historians to compare *like* disasters. This was the second outbreak of cattle plague in the first half of the eighteenth century. Comparing the interpretations and responses to the cattle plague episodes allows the historian to identify changing patterns of reaction or notable similarities without the burden of translating the institutional, cultural, or technological languages of one era of disaster to another.

⁹ Ronald Rommes, “Twee Eeuwen Runderpest in Nederland (1700-1900),” *Argos: bulletin van het Veterinair Historische Genootschap* 31(2004), 33.

¹⁰ Paulus Abrahamse van der Spek. *Het Boek Der Geschiedenisse Van Alderhande Oordelen En Segeninge Die De Heere Godt Ons Heeft Toegesonde Beginnende Met Den Jare 1738 Aangetekent Door Paulus Abramse Van Der Spek, Geboren in Het Suytjinde Van Delfgauw Onder De Heerlijkheijt Ruyven Op Den 10 Maart in Het Jaar 1723*. c.1786. Bibliotheek. B 17.664. 91 C 1. Gemeentearchief Delft, 12.

¹¹ *Ibid.*, 13.

¹² P. A. Koolmess, “Epizootic Diseases in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response,” in *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*, ed. Karen Brown and Daniel Gilfoyle (Athens, OH: Ohio University Press, 2010), 23.

In addition to mapping out the key changes and continuities between the first and second episodes, this chapter seeks to determine the social, economic, and political motivation for those changes. Why, for instance, did the popularity of secular remedies surge during this second epidemic? To what extent was this related to the same trend that saw provincial institutions begin to call on their universities for advice? Why was the second epidemic so much more virulent than the first epidemic? Did this difference derive from environmental, biological, institutional, or societal management? In answering these questions, this chapter tests the continued viability of some of the general conclusions developed in previous chapters. The novelty of the threat—such a powerful force for change in previous disasters—was clearly a non-factor during the second cattle plague epidemic. Providence continued to play a central role in all dialogues of response, including secular treatments for disease. Additionally, historical memory offered valuable models and rhetorical justification for response.

The second episode of cattle plague was primarily an era of change, however. Cattle plague was not itself new, but it nevertheless generated novel responses. Secular remedies and professional medicine assumed greater importance than in the previous epidemics. Popular scientific societies engaged cattle plague as a social and scientific problem, physicians showed increased willingness to engage animal medicine, and inoculation experiments showcased an emerging transnational network of scholars engaged in this novel technique. The providential reaction also shifted. Exclusive providentialism, the idea that response should be limited to moral and religious interpretation, assumed greater force, partly in reaction to emerging medical treatments. These changes were partly the result of the ongoing professionalization of medicine, early enlightenment ideas, as well as the worsening economic and environmental conditions of the 1740s. Just as in the previous cases, I argue that the cultural and economic stress of previous

disasters weighed heavily on the responses to this crisis. These disasters had compounding significance that stretched through the 1750s and strongly directed both the interpretation and response to cattle plague.

Studying the Second Wave of Cattle Plague

"Newspapers and government proclamations are full of the ongoing death of cattle," pamphleteer Jan Marchant proclaimed in 1745.¹³ Cattle plague was traumatic and the diversity of source material discussing the event reflects its scale and severity, especially when juxtaposed with the first episode. Undoubtedly, this difference partly resulted from the longer time span and possibly its more recent occurrence. It was also partly because, in 1744, governments no longer dealt with a novel threat. Every province affected by the second episode had prior experience with the management of cattle plague. As a case in point, provincial institutions during both episodes kept records of dead, dying, or healed cattle for the purpose of validating tax remission. This practice was limited during the first epidemic, but must have proved a valuable resource because the records during the second epidemic are much richer and better preserved. In fact, most of the bureaucratic traces (even down to the use of language) that announced new regulations including resolutions, missives, and proclamations are better preserved in the second epidemic. Whereas much of the institutional apparatus to cope with cattle plague needed to be developed during the first outbreak, it was ready made for the second.

The relative richness of this institutional documentation complements the richness of cultural source material such as diary accounts, pamphlets, newspapers, medical accounts in

¹³ Jan Marchant, *Naagalm over De Vee-Ziekte, Met Een Jaarlijst Der Voorgaande Vee-Sterftes, Sédert De Plagen Van Egipten: Alsmede De Waare Oorzaak Der Koeje-Ziekte, En De Middelen Om Die Voor Te Koomen* (Haarlem: J. Marshoorn en Iz. vander Vinne, 1745), introduction.

journals, books, and letters. These are inviting, albeit underutilized resources in historical scholarship. Firstly, because cattle plague and the history of animal human relationships in general are still understudied topics (as discussed in chapter two). Secondly, because the two cattle plagues are rarely treated to separate analyses. Aside from noting that the cattle plagues occurred during different decades of the eighteenth century, historians make little effort to compare the episodes, instead treating them as complimentary and sometimes contiguous events. This is a particularly problematic trend because many significant changes took place in those intervening fifteen years that affected the interpretation and response to the second wave of cattle plague in the Netherlands, including other nature-induced disasters. While the continuities of response between the two cattle plagues are significant and worth consideration in their own right, *change* in this instance requires further attention.

Comparing the Epidemics: Mortality and Scope

Jan Smit's allegorical print entitled *Gods Slaandehand over Nederland* (Gods Striking Hand over the Netherlands) is possibly the most famous depiction of the eighteenth-century European cattle plagues.¹⁴ (Figure 5.2) Engraved *naa het leeven* (from/after life), this image had the dual purpose of reporting ongoing events in 1744 and offering social and theological commentary.¹⁵ Its graphic representation of dead and dying cattle and complementary human

¹⁴ Jan Smit, *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit*, vol. 17499 (Amsterdam: Steven van Esveldt, 1745).

¹⁵ The phrase "*naa het leeven*" seen signed next to Jan Smit's attribution implies the purpose of the image (reporting as evidence) rather than the condition of its creation (i.e. sketches in the field) For more on the artistic definition, see: Claudia Swan, *Art, Science, and Witchcraft in Early Modern Holland: Jacques De Gheyn II (1565-1629)* (Cambridge: Cambridge University Press, 2005), 36-40. Despite being *naa het leven*, one should not assume Smit's print to be a mimetic representation of reality. Naturally, Smit exaggerates many elements in this print,

misery mirrored the lived experience of Dutch farmers and landowners during the 1740s. The background of the image depicts a pastoral polder landscape thickly populated with livestock. This image hearkens to the long history of livestock and agricultural imagery that glorified the cow as symbols of wealth and productivity during the Golden Age. Smit inverted that meaning in this print. Dead and dying cattle lie sprawled across the back- and middle ground amidst prancing horses and placid sheep. The foreground leaves little doubt about the meaning of this image. Instead of Dutch prosperity, Smit presents a vision of Dutch decline symbolized in cattle sickness, death and burial. The multitude of cattle bodies signified the severity and scope of this new outbreak.

including the scale of the disaster, but this exaggeration was itself a strategy to report on the inhabitants' experience of the plague.

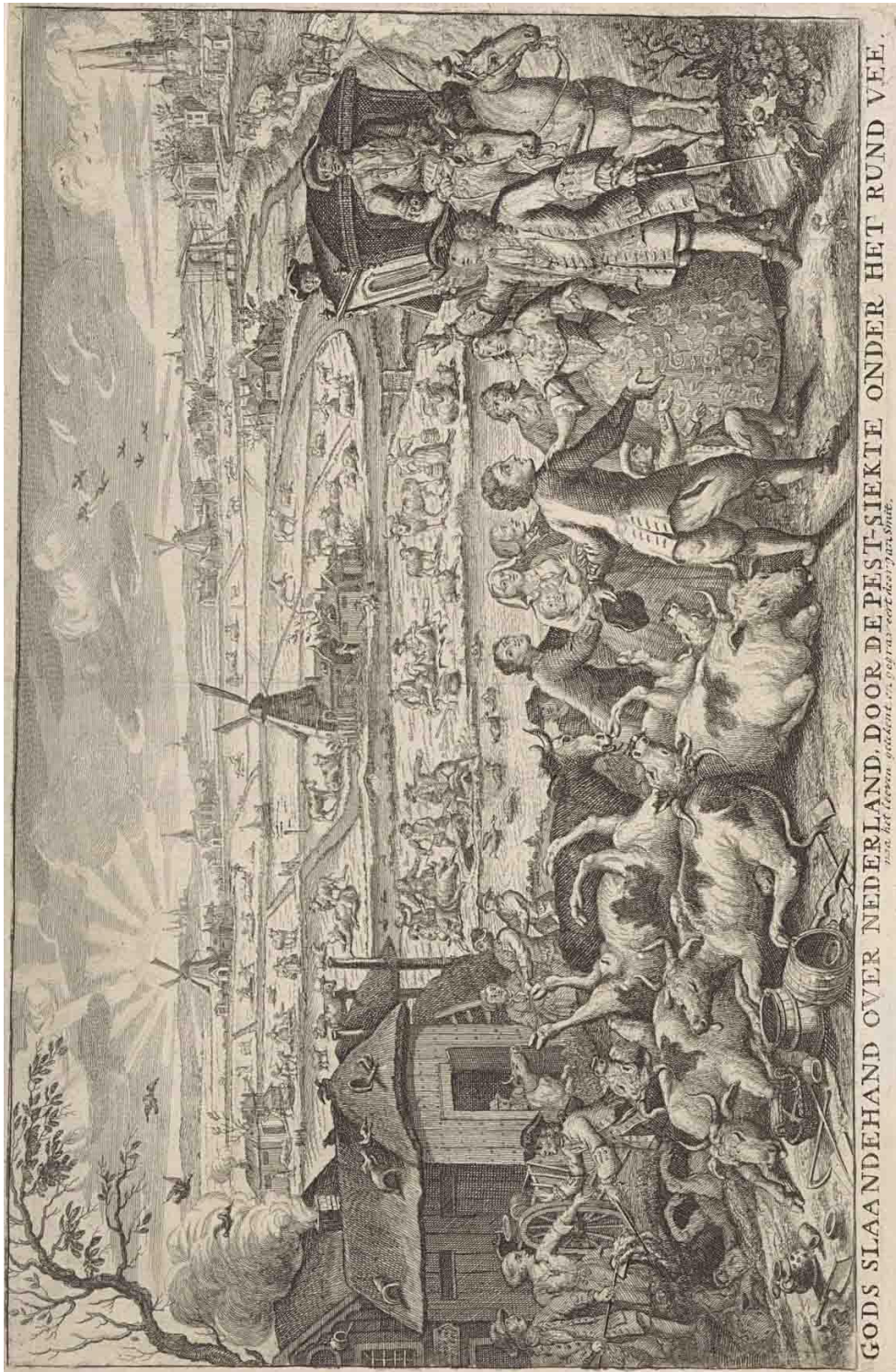


Figure 5.2 Jan Smit, *God's Striking Hand over the Netherlands by the cattle plague* (*Gods Slaandehand over Nederland door de Pest-ziekte onder het Rund vee*), 1744. This is perhaps the most famous image of eighteenth-century European cattle plague. It was also a typically Dutch inversion of the Golden Age Arcadian landscape. The fertile polder landscapes of the back and middle ground merge into a landscape of diseased and dead bodies strewn across the foreground.

Severity and duration were the most immediately recognizable differences between the first and second cattle plague epidemics. Whereas mortality figures for the entire country during the first cattle plague epidemic reached (at least) 120,000 cattle, the second epidemic may have reached one million.¹⁶ Record keeping was improved in the 1740s, but it was not comprehensive. Whereas reliable figures may exist for specific towns, or during a specific set of years, fewer regional assessments exist and most current historical estimates compile these scattered sources. Moreover, it is very unlikely that cattle plague affected all areas of the Netherlands equally. Naturally, the cattle raising provinces of Holland, Utrecht, and Friesland experienced the greatest losses. Even within these provinces, morbidity and mortality was likely variable depending upon proximity and size of herds.¹⁷ This epidemic was particularly notable, however, because of its severity outside of these major cattle provinces. In the *Westhoek* region of the southern Generality Lands (now the province of Brabant), for instance, eighty-four percent of cattle died between 1744 and 1745; in the northern portion of Zeeland, over 20,000 cattle were buried between 1745-1749; and in the *Landschap* of Drenthe in the east of the Netherlands, rough estimates place the losses of cattle at fifty percent or more.¹⁸ Cattle losses were higher in the western provinces of Holland, Friesland, and Utrecht. In Utrecht between 1744 and 46, over 33,000 cattle died; in northern Holland during the period between October 1744 and April 1745,

¹⁶ Koolmess, "Epizootic Diseases in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response," 23.

¹⁷ PhD student Filip van Roosbroeck is currently completing a dissertation at the University of Antwerp that demonstrates the highly variable regional differences between cattle mortalities in late eighteenth-century Belgium. He argues that the most important variable for transmission was herd connectivity, not density.

¹⁸ Peter Priester, *Geschiedenis Van De Zeeuwse Landbouw Circa 1600-1910* (Utrecht: HES Uitgevers, 1998), 252; Jan Bieleman, *Boeren in Nederland: Geschiedenis Van De Landbouw 1500-2000* (Amsterdam: Boom, 2008), 150.

over 77,000 cattle died; and in Friesland between November 1744 and August 1745, 135,000 cattle died.¹⁹ In terms of total mortality, the second epidemic is in a league of its own.

The highest mortalities came during the first years of the epidemic. The disease then became temporarily enzootic (non-human endemism) as surviving cattle passed on their immunity to calves. Unfortunately, as calves aged, their immunity diminished until they became fully susceptible to disease. Dutch attempts to restock herds introduced susceptible (and sometimes infected) adults, thus prompting sporadic and renewed outbreaks that could last for years. Cattle plague persisted significantly longer following the second outbreak than before. In 1757, thirteen years after the initial arrival of the plague, the bi-annual periodical *Nederlandsche Jaarboeken* reported that the plague persisted in several areas of the country. While the plague seemed to be waning in some areas, it reported, the plague persisted in parts of Friesland, Holland and in the city of “Zwolle [in the province of Overijssel] and the surrounding areas, the disastrous infection rages as strongly as ever, and in Gelderland, the city Hattem and surrounding areas [where] a miserable share are still plagued.”²⁰ Personal accounts of the disaster offer an even longer timeline for the persistence of the plague. Delft farmer Paulus Abrahamse van der Spek noted the persistence of cattle plague in *Delfland* (the area surrounding The Hague and Delft) until at least 1760 and in *Rijnland* (from Leiden to the Amsterdam to the North Sea) “one

¹⁹ A.M. van der Woude, *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw* (Utrecht: HES Uitgevers, 1983), 592. J.A. Faber, "Cattle Plague in the Netherlands During the Eighteenth Century," *Mededelingen van de Landbouwhogeschool te Wageningen* 62, no. 11 (1962), 2. Jan Bieleman, *Boeren Op Het Drentse Zand, 1600-1910: Een Nieuwe Visie Op De "Oude" Landbouw* (Afd. Agrarische Geschiedenis, Landbouwniversiteit, 1987), 320.

²⁰ *Nederlandsche Jaarboeken, Inhoudende Een Verhael Van De Merkwaardigste Geschiedenissen, Die Voorgevallen Zyn Binnen Den Omtrek Der Vereenigde Provinciën, Sederd Het Begin Van 'T Jaer*, (by de Erven van F. Houttuyn, 1757), 692.

still hears a little bit, here and there, of cattle plague in some places.”²¹ This trend highlights not only the long lifespan of this epidemic, but also its variable geographic character. Cattle plague could appear, then disappear, then reappear in the span of several years. It also affected some areas more heavily than others. The disease was dangerous, partly because it was so unpredictable.

Even when the disease waned and reports of cattle plague became fewer and farther between, provincial precautions remained in place in my parts of the Netherlands. These institutional records offer a more comprehensive, sometimes serial account of the state of disease than the scattered reportage from newspapers and diaries. The *Staten van Stad en Lande* in Groningen, for instance, banned the importation of cattle and calves into the *Westerwolde* region near Germany due to the plague’s presence in “neighboring provinces and bordering lands.”²² Plague was documented in this case despite the fact that it may no longer have been in Groningen in 1760. Farther southwest, the plague seemed to have persisted several more years. The *Staten van Holland*, for example, continued to post new restrictions on the import and transport of cattle as late as March 1764. In every region, the plague persisted years longer than any in recent memory, but precautions lasted longer because of the fear of reintroduction.

Explanations for Increased Mortality

The question remains, however, what accounted for the difference between the severity of the two epidemics? Likely, it was a combination of ecological and economic factors. If the

²¹ van der Spek, "Het Boek Der Geschiedenisse Van Alderhande Oordelen En Segeninge Die De Heere Godt Ons Heeft Toegesonde Beginnende Met Den Jare 1738 Aangetekent Door Paulus Abramse Van Der Spek, Geboren in Het Suytjinde Van Delfgauw Onder De Heerlijkheijt Ruyven Op Den 10 Maart in Het Jaar 1723.", 22.

²² *Plakaat (28 April) 1760*. Plakkaten en ordonnanties GAG, 1595-1795. 2188. 671. Groninger Archieven.

cattle plague was indeed rinderpest, than the natural variability of the virus's virulence may have been partly responsible for the increased severity. Rinderpest was an infectious viral disease that affected hooved animals and was characterized by a number of symptoms, including fever, diarrhea, and oozing mucus out of cattle eyes and noses. Indeed, the Dutch in the eighteenth century already recognized its remarkably variable symptomology. Descriptions of the disease ranged from their effects on animal diet, to their appearance, to their excrement. None of these conditions were absolute indicators of the disease, however. In a pamphlet of instructions sent from the provinces of Brabant and Holland to Groningen and published in the early months of 1744, the author acknowledged the "different signs that are found in some sick animals, and not in others." Some had bloody diarrhea, loose skin, and labored breathing, it explained, while others were constipated, emaciated, and breathed normally.²³ The variability of symptoms also extended to the rate of morbidity and mortality. "Some die on the fourth or fifth day [of infection]," the pamphlet went on to state, "and others have remained living to the fourteenth day or longer."²⁴ One report from Denmark in 1759 claimed that cattle were dying in as little as two to three days.²⁵ It is difficult to confirm precise differences between the symptoms of the first two epidemics using historical sources because of the sporadic nature of the accounts, but natural variability may very well have been present.

²³ Anon. *Aanwysinge Der Teeken en Van De Vreemde En Quaadaardige Siekte Onder Het Rundvee, Met Eenige Remedien Daar Tegen Uit Brabant En Holland Overgesonden: Op Orders Der Edele Mogende Heeren Gedeputeerde Staten Van Stadt En Lande Gedrukt*. 1744. Staten van Stad en Lande. 1. 485. Groninger Archieven, 3-4.

²⁴ *Ibid.*, 4.

²⁵ Clive A. Spinage, *Cattle Plague: A History* (New York: Kluwer Academic/Plenum Publishers, 2003), 6.

The ecological and economic contexts offer a more convincing case for the increased virulence of the second epidemic.²⁶ As early as the first epidemic, the Dutch already recognized that environmental conditions exacerbated the severity of disease and that climate in particular led to outbreaks. An anonymous pamphlet entitled *Thoughts and Advice Concerning the Ongoing Dying of Cattle* acknowledged that not only did the sickness manifest itself in different ways in different animals, but “one also finds differences in different seasons, and also in the landscapes, which in heat, drought, and other ways are very dissimilar.”²⁷ The climate of the early 1740s offered a deadly suite of conditions for cattle. A series of frosts, river floods, poor growing seasons, and plagues of mice between 1739 and 1742 either killed cattle outright or weakened them through malnutrition. Just as during the first outbreak, inclement spring weather immediately preceded the arrival of cattle plague. “This spring has been very cold and meager again,” Utrecht Priest Godefridus Ram noted in 1743, “and because everything was destroyed by the mice in 1742, there is a lack of hay and straw, many animals are dead, at by the end of May many animals could scarcely find enough food to eat.”²⁸

Nature-induced disasters with no direct relation to cattle plague also likely influenced its arrival and severity. The quick entry and spread of the disease into and throughout the Netherlands in 1744 was no doubt partly the result of farmers restocking their herds in the wake of the large-scale cattle die-offs due to floods and malnutrition. Farmers faced with harvest

²⁶ Climate is generally recognized to be a factor that influences outbreaks. Weakened animals, whether due to starvation or ancillary sicknesses, are more susceptible. Climatic extremes, rather than hot or cold weather, seems to be most important. *Ibid.*, 20.

²⁷ anon., *Bedenkingen, En Raad, Noopende De Tegenwoordige Sterfte Onder Het Rundvee*, vol. 's Gravenhage (Pieter van Thol, 1714), 6.

²⁸ Ram, “Dooopboek of Godefridus Ram,” 56.

failures and lack of fodder slaughtered not only their milk cattle, but also calves, thus undermining their ability to restock herds. Provincial governments attempted to limit the damage by banning the slaughter of cattle and lessening import duties during the early 1740s.²⁹ Whereas the War of Spanish Succession brought the disease from the steppes of Asia into the sphere of Western Europe, the more proximate rural disasters of the early 1740s pulled the disease into the Netherlands.

Comparing Epidemics: Institutional Response

Just as during the first epidemic, the control of the second cattle plague outbreak largely fell to provincial and local authorities in the Netherlands. Provinces dictated policies, oftentimes performed by local officials that delineated diseased spaces, managed the movement of animals into and out of their jurisdictions, and policed adherence to these regulations. Most of these activities found significant precedents in the earlier outbreak of cattle disease in the eighteenth century. One notable change was the speed with which institutions responded to the disease. The disease was no longer novel in the 1740s and institutions were able to draw on regulatory precedents from the past.

Previous experience with the disease largely dictated the institutional response to the second outbreak. Cattle sickness and mortality pervaded Dutch history, but the plagues of the eighteenth century stood apart because of their extent, severity, the inefficacy of remedies, and their occurrence within one human lifespan. These conditions lent a degree of novelty to the first epidemic, but cattle plague was still a vivid memory when it returned in the 1740s. In addition to the earlier continent-scale epidemic between 1713 and 1720, a different, less virulent disease

²⁹ *Plakaat (29 Nov) 1741*. Ambachtsbestuur van Velsen. 3701. 490. Noord Hollands Archief.

struck the Netherlands in the 1730s (likely Hoof and Mouth Disease).³⁰ These two disease events occurred within a generation of the 1740s and ensured that the memory of cattle plague (even lived experience) was still an active contributor. Writing in the fall of 1744, Godefridus Ram reported that “The feeling is that this is the same sickness that befell our country 33 years ago and that lasted for seven years.”³¹ Cattle plagues were not uniform in cause or consequences, yet many immediately recognized the 1744 outbreak to be similar to the first epidemic.

Provincial administrators also drew on their institutional memory in response to the epidemic. The benefits of drawing upon precedent and memory to combat cattle plague were two-fold. Provincial institutions were already familiar with the disease and had ready-made modes of response. The 12 January 1745 proclamation issued by the province of Holland, for instance, reenacted many of the regulations and procedures performed during the first epidemic. It prescribed a laundry list of familiar rules including certification for travel, quarantine, the killing of stray dogs, the cleaning of stalls, and proper burial.³² These initial responses did not veer far, if at all, from the methods created decades earlier. A second benefit was that rules could be enacted quickly. While it remains difficult to definitively demonstrate the entry date of the plague into the country, it likely arrived in Holland and Friesland in the late fall of 1744. The first proclamation to regulate cattle plague was printed on November 21, less than two months after its first appearance in the Netherlands. Similar regulations during the first epidemic

³⁰ W.H. Dingeldein, "Iets over Mond En Klauwzeer in 1732 En Vroeger," *Tijdschrift voor diergeneeskunde* 36(1933): 389-92. Ronald Rommes, "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw," *Jaarboek Oud Utrecht* (2001), 89.

³¹ Ram, "Dooopboek of Godefridus Ram," 60.

³² *Resolutie (8 Jan) 1745*. Gewestelijke bestuursinstellingen van Friesland 1580-1795. 5. 151. TRESOAR.

required half a year to enact and even longer to develop the full range of regulations that were immediately available during the second outbreak.

This tendency to draw on past responses had limitations as well. Perhaps because provincial governments were so invested in historic methods of regulation, they made little effort to improve or refine their methods. As other countries throughout Western Europe fine-tuned their institutional management of cattle plague (and had been since its European outbreak in 1711), the Dutch instituted little immediate change. Scholars often point to the *inability* of the Netherlands to implement a state apparatus with the ability to cull infected herds. England implemented this so-called Lancisi system at great cost in England (and with less success in Italy) during the first epidemic, but it was not implemented in the Netherlands during the eighteenth-century at all, despite awareness of this method.³³ This historical narrative treats the adoption of the Lancisi system as normative, however, and assumes that the United Provinces lacked the institutional coordination or authority to implement the system, primarily because of its decentralized political makeup.³⁴ In reality, there is little evidence that Dutch administrators (much less cattle owners) considered this drastic step to be a viable option. It was an incredibly expensive policy, and although the Dutch eventually adopted the practice in the nineteenth century, to assume an inability due to the decentralized nature of their governance is to ignore

³³ Lancisi, Ramazzini, and other “well-known men” were cited as early as 1714 in the Netherlands, though even this anonymous pamphlet did not recommend widespread slaughter. anon., *Bedenkingen, En Raad, Noopende De Tegenwoordige Stervte Onder Het Rundvee*, 2. The Lancisi system also failed in England during the second outbreak of cattle plague, which Joan Broad argues was due to a lack of government oversight. John Broad, “Cattle Plague in Eighteenth-Century England,” *The Agricultural history review* (1983): 104-15.

³⁴ Madeleine Ferrières argues that the Lancisi system’s adoption in Europe between 1714-1770 could be described as “a European health policy.” Madeleine Ferrières, *Sacred Cow, Mad Cow: A History of Food Fears* (New York: Columbia University Press, 2006), 189.

what historians are increasingly recognizing to be an efficient statecraft system.³⁵ This remained the case during both cattle plague epidemics. The Netherlands did not adopt the practice of culling herds because the power of tradition and institutional inertia, in this case, worked to limit innovation.

Nevertheless, many of the management challenges that provinces experienced during the first epidemic remained problematic during the second. Provinces grappled with the oftentimes-tenuous balance between restricting cattle and cattle products' movement to prevent the spread of disease and allowing the passage of animals through municipalities, provinces, and the Netherlands as a whole (the foundation of the cattle economy). Popular sentiments regarding the exacting toll of these restrictions are evident in material and textual sources. Jan Smit's *Gods Slaandehand over Nederland* (Figure 5.2), for instance, is compelling as much for its social commentary as it is for its providential meaning. It demonstrates the proper social response to intuitional regulation. In the foreground, a landlord raises his right hand pointing to heaven. His rich clothing, consort, and carriage stand in sharp contrast to the poorly dressed farmers (likely tenants) pleading for respite in front of a pile of dead cattle. (Figure 5.3) The landlord, Smit states, "neither sneers nor snarls at the poor farmers, nor threatens him with a penalty if he cannot pay his rent," but instead beseeches them to seek "comfort and piety" from God.³⁶ Government restrictions regulated both parties. Landowners lost rent when their tenants lost cattle. Smit used a providential message to promote leniency and debt forgiveness amongst landlords.

³⁵ Jonathan Israel, *Dutch Primacy in World Trade, 1585-1740* (New York: Oxford University Press, 1989), 411.

³⁶ Smit, *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit* (Amsterdam: Steven van Esveldt, 1745).



Figure 5.3 Detail of farmers pleading with landlord. Jan Smit, *Gods Slaandehand over Nederland door de Pest-ziekte onder het Rund vee*, 1744. Smit comments on the social and economic consequences of the cattle plague both in the text and by foregrounding a dispute between a farmer spokesman and a landlord. Smit opines that landlords should be generous and understanding of his tenants' troubles.

Provincial orders regarding the disposal of bodies, the import and export of cattle, and regulations for slaughter threatened tenants as well. Smit's print is also a reaction to their rural opposition. In the left foreground, another government official (likely the sheriff) directs the burial of dead cattle. (Figure 5.4) The farmers to the left of the image dutifully strip the hides and bury the bodies of cattle to the required depth (usually six feet deep). These farmers are performing the proper social response, according to Smit. "Learn from this, and behave obediently to what your government orders," Smit implored, as "they bear the responsibility of the welfare of all those in common."³⁷ Smit's print hinted at opposition to regulation and used providential rhetoric to undermine social discontent. This opposition to provincial regulation was not new. Between 1713 and 1720, many provinces had gradually come to realize that completely cutting off the cattle trade was functionally impossible due to social opposition as well as economically inadvisable. Provincial governments depended on taxes extracted from landowners. Just as the cattle plague waxed and waned, disappearing and reappearing over decades, regulations also vacillated. Provincial regulations in the province of Friesland during the second outbreak revealed an early awareness of these conditions and concerns.

³⁷ Ibid.

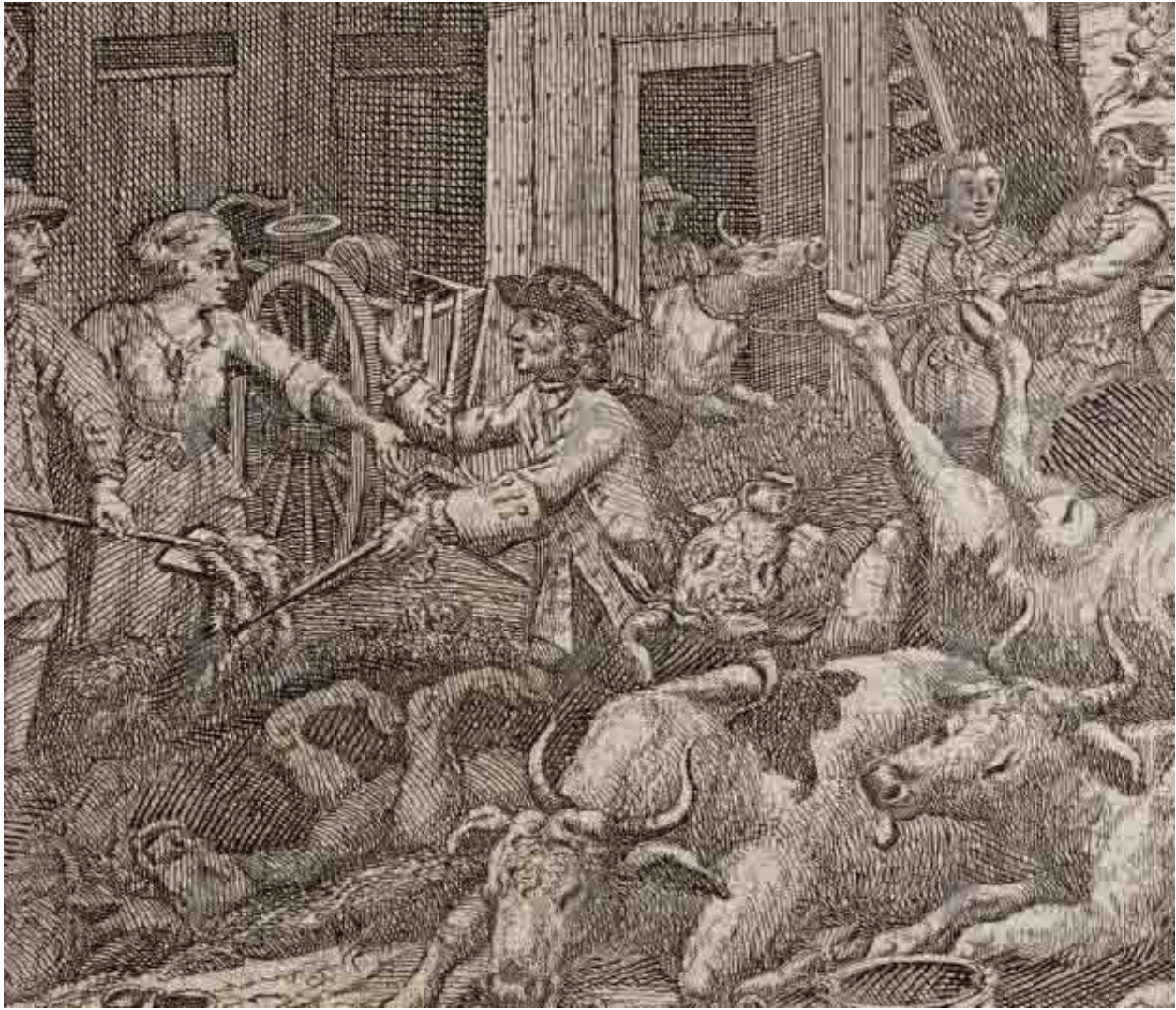


Figure 5.4 Detail of sheriff directing cattle burials. Jan Smit, *Gods Slaandehand over Nederland door de Pest-ziekte onder het Rund vee*, 1744. Smit's print depicts the proper, compliant relationship between public health officials and the farmers responsible for burying diseased cattle.

Already by December of 1744, less than a month after the arrival of plague in the middle and western countryside of Friesland, provincial administrators busily attempted to accommodate cattle owners for their loss of cattle. The *Staten van Friesland* extended permission to export hay (which had been forbidden early on during the first epidemic) to compensate for their economic troubles.³⁸ This was partly because of the fear of the spread of disease, but also because there were fewer cattle that required the available hay. As numbers of cattle fluctuated over the decade, though, Friesland repeatedly revoked and reinstated these restrictions. Even in the final throes of the epidemic in the late 1750s and early 1760s, Friesland continued to vacillate. A resolution by the *Staten van Friesland* on March 17, 1759 revealed that the province once again cancelled their ban on exporting hay and straw, as well as the importation of cattle, because “the number of infected and dead cattle has noticeably lessened.”³⁹

Changes in hay and straw regulations mirrored the fluctuating restrictions on animal movement. Holland and Gelderland enacted import and export restrictions as early as November 1744 and Utrecht and Groningen followed suit in December.⁴⁰ Friesland imposed import bans as early as the 11 December 1744, but quickly repealed them after only four months.⁴¹ Plague’s economic toll on the cattle industry (a significant source of tax revenue) required farmers to

³⁸ Meindert Seffinga. *Resoluties Van De Staten Van Friesland, 1731-1750*. Gewestelijke bestuursinstellingen van Friesland 1580-1795 - Nadere Toegang. 5. 26. TRESOAR, 81; *Resoluties Van De Staten Van Friesland, 1711-1720*. Gewestelijke bestuursinstellingen van Friesland 1580-1795 - Nadere Toegang. 5. 26. TRESOAR.

³⁹ *Resolutie (17 Mar) 1759*. Gewestelijke bestuursinstellingen van Friesland 1580-1795. 5. 166. TRESOAR, 47.

⁴⁰ Wilhelmina Maria Gijsbers, *Kapitale Ossen: De Internationale Handel in Slachtvee in Noordwest-Europa (1300-1750)* (Verloren, 1999), 93; *Plakaat (18 Nov) 1744*. Placaaten, van 1741 tot 1751; Gelderland. OTM: O 63-4112 (32). Universiteit van Amsterdam Bijzondere Collecties; J. Van de Water, C.W. Moorrees, and P.J. Vermeulen, *Groot Plakkaatboek 'Slands Van Utrecht: Aangevuld En Vervolgd Tot Het Jaar 1810* (Kemink en Zoon, 1856), 234; Staten van Stadt Groningen ende Ommelanden. *Plakaat (12 Dec) 1744*. Staten van Stad en Lande. 1. 478. Groninger Archieven.

⁴¹ Seffinga, "Resoluties Van De Staten Van Friesland, 1731-1750," 86.

restock their herds quickly. This practice was all the more important in these opening years of plague when mortality was astronomical. In the *grietenij* (municipality) of Hemelumer Oldeferd, for instance, ninety percent of the cattle died between October 1744 and January 1745.⁴² Friesland was forced to balance their concern about the spread of disease with the economic consequences of an absolute *cordon sanitaire*.

This balancing act was precarious, but in this case, Friesland and other Dutch provinces were better prepared than before to manage the disease. Friesland had already instituted a system by July of 1745 to quarantine imported cattle for two weeks in separate pastures with harsh penalties for lawbreakers.⁴³ Contemporaries were also more familiar with the epidemiology of the plague and demonstrated a more confident awareness of what likely did (and did not) transmit the disease. The slaughter of animals is a case in point. In early 1745, Johan Vegelin van Claerbergen, then mayor (*grietman*) of the Frisian town Doniawerstal, asked for “a concession to be made for the use of the fat of the beasts that have been killed by the ongoing and spreading sickness of cattle...all the more because certainly the consumption... [of] the fat and even the meat of dead animals has not had the smallest ill effects.”⁴⁴ The conditions of infection, and whether diseased cattle were suitable for consumption, had been contentious issues during the first outbreak, but greater leniency seems to have been afforded the sellers and users of cattle products by 1745.

⁴² J.A. Faber notes that this was even more extreme than the initial outbreak in Holland, which claimed 70%. J.A. Faber, *Drie Eeuwen Friesland: Economische En Sociale Ontwikkelingen Van 1500 Tot 1800* (Leeuwarden: De Tille, 1973), 166.

⁴³ *Resolutie (9 Jul)* 1745. Gewestelijke bestuursinstellingen van Friesland 1580-1795. 5. 152. TRESOAR, 92v.

⁴⁴ *Resolutie (8 Jan)*. Ibid., 151.

Official leniency may have extended to lawbreakers as well. Just as during the first epidemic, evidence in Dutch legal documents demonstrates instances of individuals ignoring restrictions, though there were fewer than during the first outbreak. In Groningen, for instance, only one case went as far as the sentencing court of the *Volle Gerecht* in Groningen. This was against the butcher Daniel Cuijter in 1745 for the slaughter of a calf, which was forbidden in order to promote the replacement of diseased cattle.⁴⁵ Cuijter was certainly not the only transgressor in Groningen during this period and the repeated printing of restrictions and bans on cattle and cattle products' movements between 1744 and 1764 in Friesland, Utrecht, Holland, and Groningen underscore how common law-breaking remained during the second cattle plague epidemic, but the overall lessening of sentencing indicates greater official accommodation of the afflicted farmers.

The history of institutional response to cattle plague was largely one of continuity. Provincial governments reintroduced many policies implemented during the first epidemic in nearly unaltered form. Most responses attempted to control cattle movement in the form of import and export restrictions and quarantines. Just as during the first epidemic, conflict arose over the implementation of these policies when the obligation to manage disease clashed with the economic necessity of promoting cattle production. The conditions of these conflicts may partly explain the continuity between epidemics, however. When institutions vacillated between restricting and promoting animal movements, they did so in response as much to the demands of farmers as to the provincial need to manage disease. Provinces needed farmers to produce

⁴⁵ *De Slager Daniel Cuijter Wegens Het Slachten Van Wrak Vee*. 1745. Volle Gerecht van de stad Groningen, 1475 - 1811. 1534. 2074. Groninger Archieven.

revenue from cattle for taxation. Their interests were not completely at odds. The clearest change between episodes was the speed with which these policies were enacted. This was likely due to the recent experience of the disease and a ready-made institutional model of response.

Comparing Epidemics: Medical Therapies

As we saw during the first epidemic, animal medicine consisted of spiritual and secular remedies, oftentimes working together. Galenic humoralism, neo-Hippocratic environmental medicine, as well as contagionist ideas dominated the medical management of the disease in coordination with prayer and penitence that provided moral remedies for the ultimate cause of the affliction. This cooperative approach characterized medical response during the first epidemic and it retained its preventative and therapeutic power into the mid-eighteenth century. Profane remedies, however, experienced a broadening of appeal during the second epidemic. Remedies developed during the first epidemic and during the interim period were reprinted and distributed throughout the United Provinces. Secular therapies, especially in the form of medicinal remedies and inoculation, also experienced a deepening of interest, especially amongst scholars tasked with curing the disease. Writing in 1745, Jan Marchant joked, “everyone want[s] to play cow-doctor.”⁴⁶ This trend is one of the most visible differences between the first and second cattle plague epidemics and highlights the increasing power and public trust in academic medicine.

While secular treatments for sick animals certainly existed in the early eighteenth century, the outbreak of 1744 sparked renewed interest in medicinal “cures” for cattle plague.

⁴⁶ Marchant, *Naagalm over De Vee-Ziekte, Met Een Jaarlijst Der Voorgaande Vee-Sterftes, Sédert De Plagen Van Egipten: Alsmede De Waare Oorzaak Der Koeje-Ziekte, En De Middelen Om Die Voor Te Koomen*, introduction.

These concoctions depended on an understanding of animal health relatively unchanged since the first epidemic. Most remedies depended on the careful management of the bodies' humors via purgatives, bleeding, and a carefully controlled diet. One set of instructions from 1744, for instance, advocated bleeding and fasting the animal, feeding it small amounts of hay and ladles of warm beer. It further suggests purging the animal every day with a mixture of sena and tartar.⁴⁷ This technique carefully adhered to the medical principles of Galenic humoralism and displays no real departure from practices in the early part of the century.

Neo-Hippocratic emphases on clean or purified environments remained important considerations during the second epidemic as well. From a therapeutic perspective, the animal and its immediate environment required diligent cleaning to remove infectious elements from their surroundings, especially from the air. Pamphlets and recipes often advised owners to wash diseased animals' mouths with vinegar and water. More often, cleanliness was prophylactic. One of the "provisional precautions against the spread of the infectious disease," one pamphlet noted, was to keep all of the stalls clean by removing hair, manure, and washing the abdomens of the animals themselves with mixtures of vinegar and salt.⁴⁸ Most accounts paid special attention to air quality as well. Instructions often advocated the use of gunpowder to dry out surroundings or drive away noxious miasmas, warm vinegar to dampen nighttime airs, and improve ventilation during the summer. Whether prophylactic or therapeutic, these techniques and recipes illustrated the endurance of these medical ideas.

⁴⁷ *Aanwysinge Der Teeken en Van De Vreemde En Quaadaardige Siekte Onder Het Rundvee, Met Eenige Remedien Daar Tegen Uit Brabant En Holland Overgesonden: Op Orders Der Edele Mogende Heeren Gedeputeerde Staten Van Stadt En Lande Gedrukt*. 1744. Staten van Stad en Lande. 1. 484. Groninger Archieven, 7-8.

⁴⁸ *Ibid.*, 6.

The extent to which these recipes were employed, their distribution, and the popular appreciation of their effectiveness is still a largely open question. However, based on the broad distribution of publications, one can infer widespread interest. Pamphlets and newspapers advertised recipes and medical books, which family members preserved and handed down.⁴⁹ (Figure 5.5) These documents could be handwritten or published, several of which editors might then compile into a single publication. Many remedies appeared immediately after the outbreak in 1744, thus indicating prior development. The aforementioned remedies from 1744 were actually sent to the province of Groningen from Brabant and Holland and printed “on the orders of the *Staten van Stad en Lande*” and hint at an interprovincial network of institutional interest.⁵⁰ Other popular remedies continued to be published and distributed well into the 1750s. The *Nederlandsche Jaerboeken* from 1749 published a report from the province of Gelderland that remedies for cattle “must be treated with the preciseness and care that you would use for people” and that rhubarb, in particular was a valuable curative for its anti-inflammatory qualities.⁵¹ The *Nederlandsche Jaerboeken* from 1754 noted the persistence of the plague in South Holland and suggested draining cattle of a half bucket of blood, while offering the cattle varying mixtures of vinegar, lukewarm water, linseed oil, cabbage, cucumber, melon seed, and as the animal

⁴⁹ Many of these recipes are now found in family archives or houses of the nobility, for instance, “Rapporten over waarnemingen van ziekte onder het rundvee te Westbroek en Achttienhoven, met mededelingen over symptomen van deze ziekte en middelen tot bestrijding, 1744-1774.” 76.145. Huis Zuilen *Utrecht Archief*.

⁵⁰ “Aanwysinge Der Teeken en Van De Vreemde En Quaadaardige Siekte Onder Het Rundvee, Met Eenige Remedien Daar Tegen Uit Brabant En Holland Overgesonden: Op Orders Der Edele Mogende Heeren Gedeputeerde Staten Van Stadt En Lande Gedrukt,” title page.

⁵¹ “Recept Voor De Ziekte Der Runderen,” in *Nederlandsche Jaerboeken, Inhoudende Een Verhael Van De Merkwaardigste Geschiedenissen: Die Voorgevallen Zyn Binnen Den Omtrek Der Vereenigde Provintien, Sedert Het Begin Des Jaers Mdcclxvii* (Amsterdam: F. Houttuyn, 1749), 90.

improved, rye bread water.⁵² Therapies were a popular subject throughout the second episode of plague and in a variety of provinces.



Figure 5.5 A packet of herbal remedy preserved in a family archive at the *Utrecht Archief*. *Rapporten over Waarnemingen Van Ziekte Onder Het Rundvee Te Westbroek En Achttienhoven, Met Mededelingen over Symptomen Van Deze Ziekte En Middelen Tot Bestrijding, 1744-1774. 1744-1774. Huis Zuylen. 76. 145. Utrecht Archief.*

There are also some indications of an international exchange of ideas on this popular level of disease response. Already during the first epidemic, Dutch scholars knew the works of Italian physicians Giovanni Lancisi and Bernardino Ramazzini who were international

⁵² "Berichten Aengaende De Sterfte Van 'T Rundvee Enz.," in *Nederlandsche Jaerboeken, Inhoudende Een Verhael Van De Merkwaardigste Geschiedenissen: Die Voorgevallen Zyn Binnen Den Omtrek Der Vereenigde Provintien, Sedert Het Begin Des Jaers Mdccxlvii* (Amsterdam: F. Houttuyn, 1754), 1327-1328.

authorities on the disease.⁵³ Lancisi's policy for preventative slaughter never received official sanction, but Ramazzini proposed medicinal remedies that more closely corresponded with Dutch animal medicine. During the second epidemic, international communication of these matters increased. Pamphlets and periodicals translated and transmitted established techniques for their Dutch readership and newspaper occasionally announced new translations of foreign remedies. In his 1745 pamphlet, Jan Marchant noted that he observed remedies coming from Brussels, Ghent, Frankfort, Aalst, Raamsdonk, and Normandy.⁵⁴ Cattle plague captured international interest and the Netherlands, a central node in early modern print culture, received new information from across Europe.

Popular remedies for cattle sickness increased in the first half of the eighteenth century largely due to the first two cattle plague epidemics, but sometimes because of related diseases. Western Europe contended with nearly constant epizootic attacks during this era. Authors often commandeered remedies developed in response to other animal diseases for use during times of cattle plague. For instance, an epidemic of *Mond en Klauwzeer* (Hoof and Mouth Disease) hit the Netherlands via Munster in 1732. In 1744, after hearing reports of a new cattle plague epidemic, the provincial governments of both Groningen and Holland republished a popular pamphlet developed during this previous epidemic that contained a collection of several recipes for "horses and horned animals."⁵⁵ Although the pamphlet noted that these remedies combatted a sickness

⁵³ Anon., *Bedenkingen, En Raad, Noopende De Tegenwoordige Stervte Onder Het Rundvee*, 2.

⁵⁴ Marchant, *Naagalm over De Vee-Ziekte, Met Een Jaarlijst Der Voorgaande Vee-Sterftes, Sédert De Plagen Van Egipten: Alsmede De Waare Oorzaak Der Koeje-Ziekte, En De Middelen Om Die Voor Te Koomen*, 2.

⁵⁵ Anon. *Remedien Tegen De Contagieuse Siekte Onder De Paarden En Hoornbeesten* (Eds. Paulus and Isaac Scheltus). 1732. Stads- en Gemeentebestuur van Beverwijk. 3769. 266. Noord Hollands Archief. This document can also be found in "Aanwysinge Der Teekenen Van De Vreemde En Quaadaardige Siekte Onder Het Rundvee, Met

that appeared in 1732 (and before that in 1682), they contained markedly similar treatments compared to those specific to cattle plague. The Dutch market for disease remedies incorporated, therefore, international accounts, but also remedies developed for different diseases.

Rare private documents, journals, and correspondence described the use of animal medicines as well. They were often developed in response to plague disasters and reinforced the usefulness of common remedies for different diseases. For instance, Anna Leurink, the daughter of a *burgermeester* in the eastern Dutch town of Enschede, described using these remedies in her journal. "On the 23rd [of March, 1732]," she began, "our cow got a fieriness under its tongue, on the 24th, there was already black pus that we scraped off with a silver fork and washed with *ettik*, root, pepper, and garlic, and salt.... on the 6th of April, we washed our cow for the last time with honey and *fosel* until we saw it was better."⁵⁶ While Leurink's curative targeted Hoof and Mouth Disease, her journal revealed that cleaning the animal and scraping the tongue (possibly a technique of Paracelsian origin) worked in this disease context as well. Indeed, although contemporaries' naming conventions and identification of symptoms indicated they could differentiate between diseases, this did not preclude common treatments.

The publishers of these medical recipes exhibited a wide spectrum of confidence as to their efficacy. The government of Gelderland, for instance, published a recipe in 1749 "whereby,

Eenige Remedien Daar Tegen Uit Brabant En Holland Overgesonden: Op Orders Der Edele Mogende Heeren Gedeputeerde Staten Van Stadt En Lande Gedrukt."

⁵⁶ Very little is written about this Hoof and Mouth epidemic, although its effects were felt from the Netherlands to Switzerland. Descriptions of its effects in the Netherlands and Germany can be found in: Jost Bühlmann, "Beitrag Zur Geschichte Der Viehseuchen, Speziell Der Maul- Und Klauenseuche in Der Schweiz" (Universität Zürich, 1916); Dingeldein, "Iets over Mond En Klauwzeer in 1732 En Vroeger; Jacobus Joannes van Deinse, "Uit Het Dagboek Van Aleida Leurink Te Losser, 1698-1754," in *Uit Het Land Van Katoen En Heide : Oudheidkundige En Folkloristische Schetsen Uit Twente* (Enschede: van der Loeff, 1975), 540.

many of the sick animals, as many as which were treated, have been returned to health.”⁵⁷ On the opposite end of the spectrum, the *Leeuwarder Courant* published a largely pessimistic appraisal provided by “a doctor” who concluded that “people will probably never find a suitable cure for the disease,” but based on its similarities to other diseases, it may be possible to lessen the effects of the sickness.⁵⁸ Authors thus distinguished between care and cure and the majority was careful to couch their cures in a language of cautious optimism.

While popular remedies were marketable and their increasing popularity likely resulted from increased need, the most significant difference between the first and second epidemic was the developing interest and confidence in animal medicine and medical science. During the second wave of cattle plague, the Dutch expressed this confidence by engaging their universities in the struggle to combat the disease, in the increasing number of physicians and other medical professionals engaged in animal medicine, and innovations like inoculation. The year 1744 was again a defining moment, both because it saw the first institutional involvement of academic medicine and because it witnessed the initiation of an international scientific dialogue about animal medicine that spanned Western Europe. In each dimension of academic involvement, proponents simultaneously stressed innovation while also grounding their treatments in established medical practice.

The outbreak of cattle plague in 1744 not only signaled the revitalization of popular remedies, but also a new emphasis on innovative and novel learned remedies promoted by

⁵⁷ “Recept Voor De Ziekte Der Runderen,” 90.

⁵⁸ *Leeuwarder Courant*, 30 August 1769, 1.

governments.⁵⁹ These developments were tightly related. Although disease management was usually under the purview of the provinces, the *Staten Generaal* offered a reward of 1000 florins for a cure in a proclamation from June 1744.⁶⁰ After this announcement, pamphleteer Jan Marchant noted, "there came, one after another, more cow remedy books and other things to light."⁶¹ The province of Holland quickly followed suit and in November, promoted its own contest. Not only did they ban the importation of cattle from the Austrian Netherlands (now Belgium), but they also offered "a premium of 1000 guilders for anyone who could find a new and innovative remedy for the cattle plague, which upon being tested is found good."⁶² Their rationale indicated that while many sorts of remedies were in use, in the opinions of expert doctors, some were "very old and inconsistent."⁶³ This plague needed novel solutions and the *Staten van Holland*, therefore, turned to the medical faculty at the University of Leiden for guidance.

The "provisional precautions" quickly offered by the medical faculty of Leiden were not substantively different from popular remedies. The faculty's advice still combined preventative medicine that involved cleaning the animals' environment, therapies involving purgatives,

⁵⁹ Dorothee Brantz tracked this phenomenon in France and Germany, though she focused on the third outbreak in the 1770s. Dorothee Brantz, "'Risky Business': Disease, Disaster and the Unintended Consequences of Epizootics in Eighteenth-and Nineteenth-Century France and Germany," *Environment and History* 17, no. 1 (2011): 35-51.

⁶⁰ Gijsbers, *Kapitale Ossen: De Internationale Handel in Slachtvee in Noordwest-Europa (1300-1750)*, 387.

⁶¹ Marchant, *Naagalm over De Vee-Ziekte, Met Een Jaarlijst Der Voorgaande Vee-Sterftes, Sédert De Plagen Van Egipten: Alsmede De Waare Oorzaak Der Koeje-Ziekte, En De Middelen Om Die Voor Te Koomen.*, introduction.

⁶² This statement was republished in *Nederladsch Gedenkboek of Europische Mercurius, Breichtende De Gesteltenissen Der Zaken Van Staat En Oorloch, in Alle Heerschappyyen En Landschappen Van Europa Benevns D' Aangrezende Gewesten. Verzien Met Alle Placaten, Edicten, Manifesten, Aanspraken, Brieven, En Andere Autentique Stukken, Van Den Tegenwoordigen Tyd. 55 Stuk. Twede Deel. Vervattende De Zes Laatste Maanden Van 'T Jaar 1744,* (Amsterdam: Erven van J. Ratelband en Compagnie, 1744), 298-299.

⁶³ "Aanwysinge Der Teeken en Van De Vreemde En Quaadttaardige Siekte Onder Het Rundvee, Met Eenige Remedien Daar Tegen Uit Brabant En Holland Overgesonden: Op Orders Der Edele Mogende Heeren Gedeputeerde Staten Van Stadt En Lande Gedrukt," 301-302.

bloodletting, and other humoral treatments.⁶⁴ Two months later, the *Staten van Utrecht* requested a similar study from the medical faculty at the University of Utrecht. Although the Utrecht faculty's recommendation differed little from Leiden's, their method was different. They tasked four surgeons to travel throughout the Utrecht countryside in teams of two, observing the effects of cattle plague in person, and interviewing the affected rural population. These interviews not only offered practical information about symptomology, but also the history of the disease. In the town of De Bilt in January of 1745, for instance, the Utrecht surgeons Jacob van Diden and H.V.D. Bosch noted, "according to the memory of the...skinner and the farmers that were present, this sickness was the same as that of over thirty years ago."⁶⁵ That these medical professionals included this information in their published (and public) report indicates the value they placed in non-expert testimony as well as history and memory as tools of analysis.

Utrecht's request was also significant because it created an exception to a provincial law that banned the "opening" of diseased cattle. The city governing council of Utrecht opted to suspend this rule so that "four experienced surgeons" could "open as many beasts as needed, and to precisely examine [the disease] and to note the condition of all parts, in the head, breast and belly, and everything else."⁶⁶ In 1713 during the previous epidemic, no similar exception had been made for surgeons to perform autopsies, but the increased severity of the second epidemic prompted the city to recognize that people "have more reasons to fear, that the deaths today are

⁶⁴ *Nederladsch Gedenkboek of Europische Mercurius, Breichtende De Gesteltenissen Der Zaken Van Staat En Oorloch, in Alle Heerschappyyen En Landschappen Van Europa Benevns D' Aangrezende Gewesten. Verzien Met Alle Placaten, Edicten, Manifesten, Aanspraken, Brieven, En Andere Authentique Stukken, Van Den Tegenwoordigen Tyd. 55 Stuk. Twede Deel. Vervattende De Zes Laatste Maanden Van 'T Jaar 1744*, 302-304.

⁶⁵ J.V. Baerle, *Gedagten Van De Heeren Professoren Uytmakende De Medicynsche Faculteyt Op De Academie Van Utrecht over De Ziekte Onder Het Rund-Vee Thans Woedende: Waar by Nog Gevoegd Zyn Eenige Der Observatien, Uit Welke De Voornoemde Gedagten Zyn Opgemaakt*, vol. 15552 (Utrecht: Jacob van Poolsum, 1745), 30.

⁶⁶ *Ibid.*, 5.

much more serious than in earlier times."⁶⁷ The increased severity of the disease in the 1740s was not merely a unique problem; it was a reason to change policy.

The significance of this decision to turn to “expert” opinions was a key change that marked a striking shift from previous approaches to cattle plague. There is no evidence that provincial government sought academics consultation during the first outbreak. Studies in early modern England and northern Germany have highlighted the static nature of veterinary science until the end of the eighteenth century, which was partly the result of physicians needing to define and defend a new field of medicine.⁶⁸ Dominik Hünninger notes that many German authors of eighteenth-century medical treatises on cattle plague felt compelled to justify their involvement.⁶⁹ This was likely due to anxiety over social status rather than medical competency. Many early modern physicians considered cattle and other “lower creatures” beneath their study. One manner of circumventing this issue was to delegate the autopsies and empirical fieldwork to surgeons. Surgeons and physicians of human medicine occupied different social positions and different levels of prestige in the early modern Netherlands. Whereas physicians were university educated and upper middle class, surgeons were tradespeople whose positions required training, but not formal education. The Utrecht report is telling in that four surgeons provided the raw data necessary for the physicians’ recommendations. The Utrecht physicians could capture high quality observations without physically manipulating animal bodies.

⁶⁷ Ibid., 6.

⁶⁸ See Louise Hill Curth, *The Care of Brute Beasts: A Social and Cultural Study of Veterinary Medicine in Early Modern England* (Leiden: Brill, 2010) for cases in England and Dominik Hünninger, *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten* (Neumünster Wacholtz Verlag 2011) for cases in northern Germany.

⁶⁹ *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten*, 65.

Another way to minimize social anxiety was to appeal to incontrovertible authorities of human medicine. In “Transaction on the Current Sickness and Death of Cattle,” four physicians reported their observations on the efficacy of remedies and theoretical rationale for their therapies. They addressed their findings to three of the most preeminent doctors and academics on human medicine in Leiden. They also repeatedly appealed to the authority of neo-Hippocratic physician Herman Boerhaave, one of the most preeminent eighteenth-century European scientists and physicians, whom they called “our great master.” Indeed, they attributed their interest in cattle plague to him. The lack of medical awareness of cattle plague was problematic, they decided, and “the great Boerhaave has truly given too much insight to let continue with such loose principles.”⁷⁰ The need for physicians to appeal to established authority can be interpreted as evidence of status anxiety, but also to the increasing scope of neo-Hippocratic influence in animal medicine. The willingness of some physicians to begin drawing connections between human and animal bodies as well as the provincial governments’ requests for medical insights speaks to a growing confidence in the medical profession to deal with animal disease.

By the 1750s, Dutch scientific societies increasingly showed interest in the disease as well and sponsored medical investigations. These societies were founded for the expressed (and enlightened) purpose of using reason to improve to Dutch society. Cattle plague was an attractive problem because it had such broad economic and societal impacts. In 1760, Jan Engelman, a doctor and core member of the *Hollandsche Maatschappye der Weetenschappen* (Holland Academy of Sciences) published his own account of observations conducted in 1757 and 1759 in

⁷⁰ Anton de Haen et al., *Verhandeling Van De Tegenwoordige Ziekte En Sterfte Van Het Rundvee, Met Waarnemingen Opgehelderd, Door Vier Geneesheeren* (The Hague: De Haen, 1745), 14.

the society's *Verhandelingen* (Transactions).⁷¹ Dutch learned societies developed along different lines from neighboring European countries and were not initiated by the provincial governments.⁷² Engelman's 1760 account, as well as his "expanded treatise" published two years later, did not offer novel perspectives on disease treatment, though they did illustrate the increasing public and scientific attention to the plague.⁷³ Importantly, Engelman was also the first to note the similarity between cattle plague and measles, as opposed to smallpox (*kinderpokken*). This was significant in light of the last and most revolutionary medical development during the second outbreak of cattle plague: inoculation.

A Novel Response: Inoculation

Historians often associate cattle inoculation with a third (less severe) epidemic that lasted from 1769 to the 1790s. In the midst of this episode, doctors like Petrus Camper and enlightened citizen scientists like Geert Reindeers famously pioneered the development of cattle inoculation in Groningen, though their efforts had mixed success.⁷⁴ Inoculation involves the transfer of live virus material from a diseased to a healthy body with the intention of creating a less severe reaction, resulting in immunity. Although inoculation had an ancient history in China and the Middle East, Europeans only began to pioneer the technique in the eighteenth century as a

⁷¹ Jan Engelman, *Waarnemingen in De Rundveesterfte in 1756 En 1759, Dienende Tot Een Voorloper Ter Nader Verhandeling over Dezelfde Stoffe*, vol. 6, Hollandsche Maatschappye Der Weetenschappen, Te Haarlem (Haarlem: J. Bosch, 1760).

⁷² W. Frijhoff and M. Spies, *Dutch Culture in a European Perspective: 1800, Blueprints for a National Community* (Palgrave Macmillan, 2004), 101-102. W. W. Mijnhardt, "Tot Heil Van 'T Menschdom : Culturele Genootschappen in Nederland, 1750-1815" (Rodopi, 1987).

⁷³ Jan Engelman, "Nader Verhandeling over De Rundveesterfte, Betreklyk Tot De Waarneemingen, Vervat in 'T Vide Deels lide Stuk," *Verhandelingen van de Hollandsche Maatschappye der Wetenschappen* 7(1762): 247-318.

⁷⁴ IJ Botke, *Boer En Heer: "De Groninger Boer" 1760-1960* (Koninklijke van Gorcum, 2002).

treatment for smallpox.⁷⁵ Likely because both diseases conveyed lifelong immunity to survivors, observers had linked cattle plague to smallpox as early as 1713.⁷⁶ Although European physicians established this connection during the first epidemic and it achieved widespread scientific interest during the third, it was during the second epidemic that scientists in the Netherlands began experimenting with the technique.

The first Dutch experiments with cattle inoculation took place in the town of Beverwijk north of the city of Haarlem in Holland in 1755. They were performed by the Arminian clergyman and naturalist Cornelis Nozeman, merchant and inventor Agge Roskam Kool, and physician Jan Tak and their work was sponsored by the *Hollandsche Maatschappye der Weetenschappen*. The capital expense of performing risky medical experiments on expensive animals was not insignificant and the willingness of the Society to underwrite this endeavor underscored their commitment to useful knowledge. In their *First Experiment over the use of Inoculation for the Infectious Disease of Cattle*, the doctors declared that the idea of inoculation “took its origins from a love of humanity and comfort for the Fatherland,” but it was also desperately necessary after over a decade of failed attempts to develop an alternate cure.⁷⁷ The lived experience of cattle plague was also a significant factor. One of the publishers asserted that he had watched “with great attentiveness” hundreds of cattle die in North Holland while he lived

⁷⁵ See: Genevieve Miller, *The Adoption of Inoculation for Smallpox in England and France* (Philadelphia: University of Pennsylvania Press, 1957). Hervé Bazin, *Vaccinations: A History: From Lady Montagu to Jenner and Genetic Engineering* (Esher: John Libbey Eurotext, 2011).

⁷⁶ The Italian doctor Ramazzini was the first to link the diseases. *Vaccinations: A History: From Lady Montagu to Jenner and Genetic Engineering*, 126; Joana Swabe, *Animals, Disease and Human Society: Human-Animal Relations and the Rise of Veterinary Medicine* (Taylor & Francis, 2002), 63.

⁷⁷ Cornelius Nozeman, Agge Roskam Kool, and Jan Tak, *Eerste Proefneeming over De Uitwerkingen Van De Inenting Der Besmettende Ziekte in Het Rundvee, Gedaan in De Beverwijk* (K. van der Sys en K. de Veer, 1755), preface.

there between 1744 and 1746.⁷⁸ This memory was a powerful statement of his personal connection as well as further evidence of his empirical outlook.

The three scientists carefully documented their preparations, activity, and maturation of the disease throughout the experiment. They monitored the physical condition of the animals (visual appearance and stool) and controlled their food, water, and ambient environment. They measured the animals' pulse and documented the stall temperature. They also selected a wide variety of animals, choosing various ages and breeds, some having had the disease previously, mostly not. They also used different instruments and performed the incision needed to inoculate the animal in various locations of the cows' bodies. Only three of the original seventeen animals survived inoculation, however, and one of those had contracted the disease earlier.⁷⁹ While the experiment failed to produce favorable results, they immediately used their findings to suggest further improvement to future methods. "Our chief hope to make this experiment successful," they concluded, was to perform the inoculations on healthier, better fed animals, with "the benefit of a better season where the animals are healthier and better prepared to receive the infection."⁸⁰

This experiment was the beginning of inoculation in the Netherlands, but it was actually the second European attempt to inoculate against cattle plague.⁸¹ The first known attempt was published in the journal *Gentleman's Magazine* in 1754, an early print proponent of the

⁷⁸ Ibid., 18.

⁷⁹ William P. Taylor, *Rinderpest and Peste Des Petits Ruminants: Virus Plagues of Large and Small Ruminants* (Elsevier Science, 2005), 92.

⁸⁰ Nozeman, Kool, and Tak, *Eerste Proefneeming over De Uitwerkingen Van De Inenting Der Besmettende Ziekte in Het Rundvee, Gedaan in De Beverwijk*, 88.

⁸¹ For one of the most complete accounts of the early inoculations, see: C. Huygelen, "The Immunization of Cattle against Rinderpest in Eighteenth-Century Europe," *Medical History* 41, no. 2 (1997): 182-96.

technique.⁸² While the experimenters in Beverwijk denied awareness of this prior study, the combination of these two attempts signaled the beginning of a decades-long struggle to develop cattle inoculation. Interest was high, particularly in the 1750s when journals in England, Germany, and Holland translated and republished new attempts. The well-known anatomist and surgeon in The Hague, Thomas Swenke, published his own experiment in both the *Gentleman's Magazine* and the *Bremisches Magazin zur Ausbreitung der Wissenschaften* in Germany in 1755 and 1756.⁸³ While Swenke's experiment also had "very bad effects," the *Gentleman's Magazine* and others remained positive.⁸⁴ Speaking about the Beverwijk study, the *Magazine* reprinted a letter from Amsterdam reporting that "the ill success of the above instance had, however, so effectually deterr'd others, but that an owner near the same place, who has suffer'd much from this fatal distemper among his cattle, is determined to make a still further trial."⁸⁵ Dutch experiments with inoculation developed in a growing and interconnected scientific dialogue that crossed national borders.

Scientists and amateurs across northwestern Europe continued to experiment with cattle inoculation throughout the second wave of cattle plague.⁸⁶ Daniel Peter Layard, a doctor and Fellow of the Royal Society in London, for instance, was convinced of the "analogy" between

⁸² For more on the inoculation of humans against smallpox, see: Miller, *The Adoption of Inoculation for Smallpox in England and France*. For more on the *Gentleman's Magazine* and the professionalization of medicine, see Roy Porter, "Laymen, Doctors, and Medical Knowledge in the Eighteenth Century: The Evidence of the Gentleman's Magazine," in *Patients and Practitioners: Lay Perceptions of Medicine in Pre-Industrial Society*, ed. Roy Porter (Cambridge: Cambridge University Press, 1985).

⁸³ Thomas Swenke, "Schreiben Des Herrn Doct. Swenke Der Anatomie Und Chirurgie Professors Im Haag Die Einpropfung Des Hornviehs Betreffend," in *Bremisches Magazin Zur Ausbreitung Der Wissenschaften, Künste Und Tugend* (Hannover: Nicolai Forsters and Sohns Erben, 1756).

⁸⁴ "A Letter from Dr. Swencke, Professor of Anatomy and Surgery at the Hague, on the Subject of Inoculating Horned Cattle," in *Gentleman's Magazine* (London: D. Henry and R. Cave, 1755), 464.

⁸⁵ "Mr. Urban, Amsterdam, April 1755," *ibid.*, 160.

⁸⁶ Taylor, *Rinderpest and Peste Des Petits Ruminants: Virus Plagues of Large and Small Ruminants*, 92.

smallpox and "cattle distemper" and published his results in 1757.⁸⁷ Inoculation continued in the Netherlands as well. In 1758, a doctor from Hoorn named J. Grashuis published another account of inoculation in a compendium of *Treatises from the Newest Works of the Societies of Science in Europe and other Learned Men*.⁸⁸ He not only related the continuing efforts of his countrymen to develop this technique, but also his own elaboration and improvements upon the original methods laid out in Beverwijk. While some people had been scared away by failure, he maintained that cattle needed only to be inoculated and made sick to an appropriate degree, and "this can be done, if one makes good choices about the animals, which would be inoculated, also the stuff and the technique of inoculation."⁸⁹

Not all scientists agreed that inoculation was a viable remedy. Jan Engelman, for instance, denied the analogy between smallpox and cattle plague, stating that it was much more similar to measles.⁹⁰ Other observers questioned the wisdom of purposefully infecting cattle, which would then be potential vectors for the disease and its further spread. Still others stated that it was immoral to cause the death of the animal via a disease.⁹¹ Inoculation was also expensive and risky. Individual experimenters sometimes used their own animals, but large experiments like the Beverwijk study required significant investments from wealthy benefactors

⁸⁷ Daniel Peter Layard, "A Discourse on the Usefulness of Inoculation of the Horned Cattle to Prevent the Contagious Distemper among Them. In a Letter to the Right Hon. George Earl of Macclesfield, P. R. S. From Daniel Peter Layard, M. D. F. R. S.," in *Philosophical Transactions* (1758), 528.

⁸⁸ J. Grashuis, "Berigt Aangaande De in-Enting Der Besmetlyke Ziekte in Het Rundvee in Een Aanmerkelyk Getal Beesten Te Werk Gesteld, En Tot Verdere Beproeving Onze Landgenooten Voorgehouden Door Den Heer J.G.," in *Uitgezogte Verhandelingen Uit De Nieuwste Werken Van De Societeiten Der Wetenschappen in Europa En Van Andere Geleerde Mannen* (Amsterdam: F. Houttuyn, 1758).

⁸⁹ *Ibid.*, 248.

⁹⁰ W.J. Paimans, "De Veeartsenijkunde in Nederland Voor De Stichting Der Veeartsenijschool De Utrecht," in *Een Eeuw Veeartsenijkundig Onderwijs. 'S Rijks-Veeartsenijschool, Veeartsenijkundige Hoogeschool, 1821-1921* (Utrecht: Senaat der Veeartsenijkundig Hoogeschool te Utrecht, 1921), 9.

⁹¹ Taylor, *Rinderpest and Peste Des Petits Ruminants: Virus Plagues of Large and Small Ruminants*, 92.

or members of scientific societies. Whether for medical, moral, or economic reasons, inoculation was a highly debated issue.

Even so, this early evidence of inoculation demonstrates that the narrative of these enlightened cattle inoculators should at the very least be repositioned from the later epidemic to this second outbreak. This evidence also reveals a demonstrable shift in the manner in which the Dutch used science to combat animal disease. Secular medicine in general enjoyed an increasing exposure in popular and professional print during the 1740s and 1750s. Popular remedies that drew on centuries old understandings of disease and treatment reached new and broader audiences through international networks made possible through newspapers and pamphlets. In this milieu, provincial authorities called upon medical doctors to contribute their expertise to the cattle plague dialogue and newly emerging scientific societies like the *Hollandsche Maatschappye der Weetenschappen* added further resources to this conversation. Even Jan Engelman's rejection of inoculation was itself facilitated by the Holland Society and was published in its *Transactions*. These developments built on much of the knowledge gained during the first epidemic thirty years earlier. Even novel remedies like inoculation depended upon the recognition (if contested) of an analogy between smallpox and cattle plague. Inoculation was the culmination of scientific dialogue arising out of the second outbreak of cattle plague, but it was heavily conditioned by the experience of the previous epidemic. Scientists challenged the proponents of cattle plague on several grounds: economic, moral, and medical. Inoculation also revealed one more profound change. They challenged it on providential terms.

Comparing Epidemics: Spiritual Remedies and Exclusive Providentialism



Figure 5.6 Anonymous, “Farmer Lamenting the Cattle Plague” (“*Boer klagend over de veepest*”) from the pamphlet *Den Klagenden Huysman*, 1745.

Despite these new developments in animal medicine, religion still offered the dominant mode of understanding disaster during the eighteenth century, including throughout the second epidemic of cattle plague. A providentialist discourse on the disease immediately reemerged as soon as reports announced the arrival of the plague and continued throughout its duration.

Whether in the form of provincial decrees, sermons, or religious pamphlets, providence was a powerful explanatory presence during the disaster and publishers across the Netherlands marketed religious explanation of the disease from South Holland to Friesland to Brabant.⁹² Just as with floods, and shipworms, divine providence established a causal connection between human sin and nature-induced disaster. This “sin economy” underlay the majority of responses. The wages of this economy were largely unchanged since the first epidemic of the eighteenth century.⁹³ Human sin directly resulted in *Gods slaande hand*, which oftentimes manifested itself in nature-induced disaster. Providential texts and images (Figure 5.6) argued that plague could be lifted with prayer, penitence and renewed morality. The providential narrative of the second epidemic of cattle plague is largely one of continuity. Providentialists revisited older interpretations of animal plague, listed general and specific sins responsible, and cooperated with provincial governments to manage the disease. There were also subtle differences that distinguish this second epidemic from previous disasters. Principal among these were developing conflicts that emerged between an exclusive providentialist vision of disaster and a providentialism that accepted human intervention.

⁹² Pamphlet production of sermons and other narratives was highest in 1745, but continued into the 1760s. See: Johannes Barueth, *Davids Wyze Keuze Uit Drie Plagen En Ware Boetvaardigheid Onder Gekoze Pestilentie: In Deze Dagen Van De Pest-Ziekte Onder Het Rundvee* (Rotterdam: Jacobus Bosch, 1745). anon., *De Nodige Gelatenheit in Elenden, De Ziele Voorgesteld in Ene Alleenspraak over 1 Sam. Iii: 18* (Leeuwarden: Pieter Koumans, 1745). A. van Gennep, *Het Hertnypend En Besmettelyk Sterven Onder Het Rundvee, by Wyze Van Waarschouwing, Tot Voorkoming Van Swaarder Straffen Onder Het Menschdom* (Breda: Willem Goetzee, 1745). Joachimus Mobachius, *Den Vrezelyken Zamenloop Van Veele Gedugte Oordelen Gods, Als Van Alverwoestende Oorlogen, Swaere Overstromingen, Ontzachelyke Aerdbevingen, Aenhoudende, En Meer En Meer Woedende Runder-Pest, Enz. Enz.: Als Zoo Veele Voorboden Van Eenem Geheelen Ondergang, Zoo Het Niet Door Eene Spoedige Bekinghe Werde Voorgekomen: In Der Zelfer Naere Omstandigheden Verdoond Uyt Ps. Xlvi : 2-9. Op Den Jongsten Biddag Dezes Jaers 1760, Den 20. Febr* (Gorinchem: Teunis Horneer, 1760)..

⁹³ Wolfgang Behringer, ""Kleine Eiszeit" Und Frühe Neuzeit," in *Kulturelle Konsequenzen Der "Kleine Eiszeit"*, ed. Wolfgang Behringer, Hartmut Lehmann, and Christian Pfister (Göttingen: Vandenhoeck & Ruprecht, 2005), 15. Dominik Hünigler also identifies this sin economy at work in northern Germany during the second outbreak of cattle plague. Hünigler, *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten.*: 36-64.

Just as with other disasters of the eighteenth century, memory and the history of previous disasters remained a powerful rhetorical force during the second epidemic. Moralists interpreted the reappearance of cattle plague as further confirmation that the Netherlands was experiencing moral decline. They also distinguished the 1744 outbreak from previous disasters, however. In the text of Jan Smit's engraving "Gods Striking Hand over the Netherlands," (Figure 5.2) the author reminded the reader of the multitude of cattle plagues since the Medieval Era, not to mention the more recent plagues in 1651, 1682, and 1713. These "visitations were terrible," the author went on the state, "but they cannot be compared to the present."⁹⁴ Another anonymous author of "Care of Cattle and the Herders Complaint about the Rinderpest" compared cattle plague to flooding and concluded that plague was far more devastating. Unlike flooding which left "a rich treasure of fat silt" after the dikes were repaired and the water drained, cattle plague left only "a horrible stench that fouls nearly the entire land."⁹⁵ The history and memory of past disasters not only confirmed the providential origins of the disease, but also underscored its particular severity.

The memory of past disasters was also a useful didactic tool. Referring to the dying groans of cattle, the same anonymous authors of "God's Striking Hand" asked whether "these lost voices make an impression upon your hearts?" "Possibly yes," he conceded, which explained the announcement of a recent thanks, fasting, and prayer day. "But unfortunately," he continued, "scarcely is this day over, that most people find little more reason to grieve over their

⁹⁴ Smit, *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit* (Amsterdam: Steven van Esveldt, 1745).

⁹⁵ anon., *Veezorg, Herdersklagt over De Runderpest* (Dordrecht: Blusje en Zoon, 1755), 5.

sins and confess them to God with heartbreaking repentance, as if the celebration of this one day had expunged their sins.”⁹⁶ God’s repeated punishments were necessary reminders of the sinful condition of the Netherlands. Moralists often spoke in generalities, though some argued that cattle plague resulted from specific sins. Pieter Liesveldt identified some of the responsible human activities in a published a dialogue between God and the “*inwoonders*” of the Netherlands. When asked why He inflicted this sickness upon the Netherlands, God responded that the Dutch brought this disaster upon themselves with their “pride, lying, whoring, deception, violation of his name, and drunkenness.”⁹⁷ Hollander Koenraad Blom argued in his 1746 pamphlet that it was “freethinking, deistry, atheism, and wrongheaded feeling coupled with defamation of truth and devotion.”⁹⁸ While Liesveldt’s list identifies common moralistic concerns in early modern providential literature related primarily to social proprieties, Blom identified intellectual crimes. This reasoning was neither unique to the 1740s, nor to the eighteenth century, but moralists rarely connected intellectual crimes to cattle plague before this second epidemic.

Cattle plague was unique amongst eighteenth-century disasters because human sin primarily resulted in non-human suffering. Many Dutch moralists recognized the seeming injustice of this divine response. “Must my cattle, Alas, My precious cattle bear the punishments for my sin,” one anonymous pamphleteer wondered. I reproach myself, he continued, “that God

⁹⁶ Smit, *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit* (Amsterdam: Steven van Esveldt, 1745).

⁹⁷ Pieter Liesveldt, *Neerlands Oordeel, Ofte Levendig Vertoog Van De Slaande Hand Gods, over De Bedroefde Sterfte Onder Het Rund-Vee. Voorgesteld in Een Saamenspraak*, vol. 17498 (Nieuwkoop: Joh. van Abkoude, 1745), 8.

⁹⁸ Koenraad Blom, *Hiskia’s Dank- En Lof-Offer Voor Gods Wonderbare Genesing, Den Heere Toegebragt in Syn Dank-Schrift Jesaia 38 Vs. 16-20* (Amsterdam: Adrianus Douci, 1746), preface, 3.

chastens the guiltless cattle for my guilt.”⁹⁹ “They call to us with their wailing,” another anonymous author stated, “we bear these punishments, and they the consequences.”¹⁰⁰ While cattle often died because of river and coastal floods and killer frosts, the severity of these disasters were often measured in their cost to human life and well-being. Cattle plague caused economic suffering, but the disease itself affected only cattle and the visceral, guilt-ridden reaction of some pamphleteers reveals the critical difference between this and other disasters of the eighteenth century.

Providence offered not only a framework for understanding disaster, but also a foundation for response. Just as during the first epidemic, provincial governments and the *Staten Generaal* called upon clergymen to institute days of thanksgiving, fasting, and prayer. The rationale for instating a monthly fasting and prayer day by the *Staten van Stad en Lande* in Groningen “that the Almighty will cease the calamitous and destructive sickness and death amongst the cattle” was unchanged since the first epidemic, however.¹⁰¹ Spiritual responses like prayer were therapeutic or preventative. For instance, the province of Groningen’s first proclamation that acknowledged the approach of cattle plague through “neighboring lands” in December 1744 listed prayer as one of several preventative measures. In addition to instituting the usual restrictions of cattle and human movement through import restrictions and bans on beggaring, they beseeched Groninger clergymen to “pray and beg, that it may please the Lord to protect and guard this province from the terrible plague and to free those in other provinces and

⁹⁹ Anon., *Veezorg, Herdersklagt over De Runderpest*, 4,6.

¹⁰⁰ Smit, *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit* (Amsterdam: Steven van Esveldt, 1745).

¹⁰¹ *Plakaat (27 Aug) 1745*. Staten van Stad en Lande. 1. 478. Groninger Archieven.

lands where it is already raging.”¹⁰² These cooperative measures between provincial governments and religious institutions operated according to largely unchanging interpretations of the sin economy and are themselves evidence of the continuity of response through the early modern period.

Prayer was not the only spiritual remedy, however, and the Netherlands was not entirely Protestant. The Dutch had tolerated Catholics since the Dutch revolt in the sixteenth century. Despite operating under Reformed Calvinist-dominated governments, Catholic communities retained significant influence and their responses to cattle plague in the 1740s highlighted how disease remedies were used by both sides as tools of social condemnation. In Catholic communities in the Netherlands, parishioners turned to the Saints to offer miraculous cures, particularly St. Anthony the Abbot (patron saint of infectious diseases). For instance, the waters and the relic of St. Anthony in the town of Culemborg in the province of Gelderland were widely renowned for their healing power. The Utrecht priest, Godefridus Ram was convinced of its power. He noted in his journal "in the last few days, Jesuit missionaries arrived who brought hope in the form of the renowned water of Culemborg here, with which we in great confidence have given to our animals, so that no other medicines were required from Apothecaries."¹⁰³ The waters were famous prior to the first outbreak of cattle plague, though then it was due to its restorative powers in the face of human plague. In 1745, news of this miraculous water created a sensation across the border of Gelderland into Utrecht and Holland. Pilgrims needed to travel via

¹⁰² *Plakaat (12 Dec) 1744*. Ibid.

¹⁰³ J.G.M. Boon, "Historische Aantekeningen Van Een Pastoor," *Heemtydinghen: Orgaan voor de Streekgeschiedenis van het Stichts-Hollandse Grensgebied* 8, no. 15 (1965): 6-9, 8.

Utrecht to arrive in Culemborg and one account noted that whereas one *trekschuit* (passenger barge) from Leiden to Utrecht was typical traffic, during the height of the pilgrimage, “oftentimes two, three, even four came” with visitors seeking the blessed waters.¹⁰⁴ This phenomenon hearkened back to the similar occurrence in North Holland in 1713.¹⁰⁵ Just as before, Protestant onlookers condemned this sacrilegious phenomenon, and denounced the Catholic cure as mere “water” and the pilgrims as “foolish people.”¹⁰⁶ Perhaps due to this conflict, the phenomenon was short-lived. Protestants announced that the superstition faded as the waters showed no curative powers, and Catholics accused the government of suppressing the event.¹⁰⁷ This example is interesting because it is yet another indication of the contested nature of religious pluralism in the Netherlands, but also for its striking similarity to the similar occurrence in 1713 in North Holland. Even non-Protestant spiritual plague treatments displayed continuity.

The most direct challenge to the providentialist interpretation of cattle plague came from the literature on inoculation. Few authors prior to the second outbreak of cattle plague overtly denied the providentialist discourse on disaster. Of the medical responses to cattle plague, only those that favored inoculation challenged providential interpretations. These challenges were both social critique as well as evidence of an emerging enlightened discourse on the ultimate meaning of disaster and the role of scientific response. The challenge to the providential reading

¹⁰⁴ A.W.K.V. van Oudheusden, *Historische Beschryvinge Van Culemborg; Behelzende Een Naemlijst Der Heeren Van Bosichem, Benevens Der Heeren En Graeven Van Culemborg ...: Mitsgaders Een Beschryvinge Van De Stad Culemborg* (Utrecht: J. H. Vonk van Lynden, 1753), 384.

¹⁰⁵ See chapter II.

¹⁰⁶ van Oudheusden, *Historische Beschryvinge Van Culemborg; Behelzende Een Naemlijst Der Heeren Van Bosichem, Benevens Der Heeren En Graeven Van Culemborg ...: Mitsgaders Een Beschryvinge Van De Stad Culemborg*, 385.

¹⁰⁷ D. van Adrichem, "Een Nieuwe Devotie Door De Vee-Ziekte Van 1744," *Archief voor de geschiedenis van het aartsbisdom Utrecht* 42(1916): 373-83.

of cattle plague appeared as early as 1755 in the “First Experiment” on inoculation in the Netherlands sponsored by the *Hollandse Maatschappye der Weetenschappen*. In the preface to their publication, the authors noted the “prejudice” they observed which was instigated by “so-called religion and conscience.”¹⁰⁸ In addition to the financial cost of inoculation, medical skepticism, and the fear that inoculated cattle might spread the disease to healthy cattle populations, cattle inoculators often noted popular opposition to their work for religious reasons.¹⁰⁹ Cattle plagues were divine punishments and to work against them was to undermine God’s lesson.

Scholars have not ignored this early conflict between enlightened medical practitioners and their popular, oftentimes rural opposition, although they often situate this discussion during the third epidemic in the last decades of the eighteenth-century.¹¹⁰ It was during this third outbreak that scholarly interest in inoculation climaxed in the Netherlands as physicians like Petrus Camper, Wouter van Doeveren, and later Wijnold Munniks performed experiments and presented their findings at the University of Groningen as other scholars worked in Utrecht and Friesland. The failure of the experiments in Friesland prompted the provincial government to declare that the plague resulted from God’s displeasure and declared a day of fasting and prayer

¹⁰⁸ Nozeman, Kool, and Tak, *Eerste Proefneeming over De Uitwerkingen Van De Inenting Der Besmettende Ziekte in Het Rundvee, Gedaan in De Beverwijk*, preface, 5.

¹⁰⁹ Providential arguments against cattle inoculation may have derived from similar arguments made against inoculation of people as early as the 1720s. The Middelburg doctor Aarnoudt Helvetius, for instance, argued “we are of the opinion that it would be best if this technique never have been thought of or acted upon...because it is a practice that is directly opposed to the revealed word of God.” Cited in Jan Willem Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)* (Zwolle: Waanders, 1992), 60.

¹¹⁰ Koolmess, “Epizootic Diseases in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response.” The most thorough treatment is in Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)*.

in November 1769.¹¹¹ This was not the only indication of increasing religious opposition to inoculation. Geert Reindeers, a farmer-scholar from Groningen complained that ignorant opponents condemned his own experiments as atheistic and contrary to the will of God.¹¹² The origin of this discourse, however, can be located during the previous epidemic.

Perhaps the most strident voice in favor of inoculation and against exclusive providentialism came from a Frisian minister. Eelko Alta performed several inoculation experiments in 1755 and 1759 and published his findings in 1765.¹¹³ Alta was motivated by a public request by the *Hollandsche Maatschappye der Weetenschappen* for explanations about the “natural origins of the cattle plague.”¹¹⁴ He began by apologizing for having kept his findings to himself for so long, but explained that he did so, not out of “willfulness, but because an article about inoculation for this sickness was such a tender point, where people almost nobody dared to speak, where those that understood it and those that did not were very much against it, and most out of an incorrect understanding of the disease.”¹¹⁵ Alta explained his research methods and results in great detail and concluded that the “natural origins” of the disease could be found in a number of factors, many environmental including invisible vectors he referred to as *schepselen*.

Alta’s work is significant because it described his process, his successes and failures, but also because he engaged his opposition. He described their position and responded to them. He

¹¹¹ Huygelen, “The Immunization of Cattle against Rinderpest in Eighteenth-Century Europe,” 189.

¹¹² Ibid., 190.

¹¹³ Eelko Alta, *Verhandelinge over De Natuurlyke Oorzaaken Der Ziekte Onder Het Rund-Vee En Derzelver Langere Duuringe Als Te Vooren, Waar In ... De in-Enting Derzelve ... Wordt Aangepreezen: Gaande Vooraf Twee Vertoogen, Gezonden Aan De Hollandse Maatschappye Der Weetenschappen, Ter Beantwoording Eener Vraag over Deeze Stoffe in 1759 Voorgesteld En in 1760 Herhaald* (Leeuwarden: Wigerus Wigeri, 1765).

¹¹⁴ Ibid., 4.

¹¹⁵ Ibid., 3.

also established his own position as an expert. "Although most knowledgeable people are usually with me here of the same feeling, namely naturalists and doctors," he explained, "there are still far too many people that think that the cattle plague is an unavoidable judgment of God, that through his Almighty power and in unavoidable ways not only afflicted us the first time [in 1713], but now in the same manner again."¹¹⁶ Alta placed himself firmly within the learned camp and differentiated himself from the less "knowledgeable," whom he later identified as "farmers and many other people."¹¹⁷ Alta's identification of rural opposition is somewhat surprising considering their history of working with physicians during the second epidemic of cattle plague. Many of the medical reports on cattle plague noted the valuable information gleaned from their owners. Alta does not develop this social distinction further. The only society for which Alta claimed participation was learned society.

Alta attributed the opposition to inoculation to a number of explanations. "Some err," he stated, out of "simplicity or oversight, some from a wrong understanding of God's providence, or out of conceitedness."¹¹⁸ This antagonism extended to an outright denial of the "natural origins" of cattle plague. They argued, according to Alta, that the disease "was wrought by God's immediate, supranatural, and exclusive *slaande hand*."¹¹⁹ Evidence from providential literature only partly supports this exclusivist position. The anonymous author of the 1755 poem "Care of Cattle," for instance, proclaimed that "no stall, no open field, no grass [referring to environmental remedies], no herbs [referring to medicinal remedies], nothing can free the herds

¹¹⁶ Ibid., 31.

¹¹⁷ Ibid., 108.

¹¹⁸ Ibid., 31.

¹¹⁹ Ibid., 32.

from this eradicating death.”¹²⁰ The poem itself was likely written prior to the first public announcement of inoculation experiments, so it is unsurprising that inoculation makes no appearance. The Hollander Jacob Pos evinced a similar pessimism about medicinal remedies, though his was more a reaction to the perceived dishonesty of the suppliers and expense of the medicines. “Every day, the newspapers are full of remedies against the cattle plague despite their being fruitless and unnecessary,” he noted in his diary in 1744.¹²¹ Pos firmly believed that the cure could only come from God. Remedies were also expensive. Jan Kampman traveled from Pos’s town of Oud-Loosdrecht to visit “a physician in Asperen” and paid the princely sum of 36 guilders for flask of medicine.¹²² This type of pessimism about the efficacy of secular remedies was partly a response to quacks and the expense of medicine in the face of a seemingly uncontrollable plague. Opposition to inoculation would have been doubly understandable given its history of failure.

Nevertheless, Alta took issue with his opponents’ rationale. Cattle plague was merely a disease, and as such, no different from others natural affliction. “One has no more reason to think this sickness is an unavoidable punishment from God or providence than any other sickness, disaster or uncommon occurrence,” he argued.¹²³ As a disease, it deserved to be treated like a disease. A second point of opposition was that the very lack of understanding of the disease was

¹²⁰ anon., *Veezorg, Herdersklagt over De Runderpest*, 6.

¹²¹ J. Pos and J.F.C. Schlimme, *Het Dagboek Van Jacob Pos* (Historische Kring, 1992), 9.

¹²² *Ibid.*, 9.

¹²³ Alta, *Verhandeling over De Natuurlyke Oorzaaken Der Ziekte Onder Het Rund-Vee En Derzelver Langere Duuringe Als Te Vooren, Waar In ... De in-Enting Derzelve ... Wordt Aangepreezen: Gaande Vooraf Twee Vertoogen, Gezonden Aan De Hollandse Maatschappij Der Weetenschappen, Ter Beantwoording Eener Vraag over Deeze Stoffe in 1759 Voorgesteld En in 1760 Herhaald*, 35.

evidence of its divine origins. Alta deemed this belief “absurd and ridiculous.”¹²⁴ Many phenomena in nature defied explanation, he argued, but he marveled at the power of technologies like the microscope and barometer to illuminate these “great secrets of nature.”¹²⁵ The disease was natural, he argued, because it acted naturally, it transmitted itself between animals in a recognizable fashion, was long lasting, and mimicked the pattern of the previous epidemic.¹²⁶ Opponents of inoculation, particularly those using an exclusivist providential rationale, depended on a characterization of the plague as unique, unknowable, and unstoppable. Alta, by contrast, acknowledged a present lack of understanding, but patently denied its uniqueness and invulnerability.

Alta offered an optimistic appraisal of the power of his method to discover and solve this natural problem. His optimism did not preclude providence. Alta was a minister who believed that God steered the world via general providence. He merely denied the exclusivity of special providence. The disease could be both directly ordained and have natural causes. Providentialism did not preclude optimistic responses to disaster. Alta’s most powerful analogy fittingly placed this discussion in the context of other disasters, namely those that had affected the Netherlands during the period of disaster. The proper response to wars, famine, floods, and disease, Alta argued, was not exclusive providentialism; it was “paying taxes, stocking food, strengthening dikes, and practicing medicine.”¹²⁷ This analogy places cattle plague in a relationship with other disasters, each requiring responses during the eighteenth century. The context of other disasters,

¹²⁴ *Ibid.*, 39.

¹²⁵ *Ibid.*, 46.

¹²⁶ *Ibid.*, 52-56.

¹²⁷ *Ibid.*, 163.

particularly those occurring in the tumultuous 1740s, affected the institutional, medical, and spiritual dimensions of cattle plague response.

The Second Epidemic of Cattle Plague in an Era of Disaster

By the 1740s, the Dutch had weathered nature-induced disasters that affected nearly every province. Cattle plague, flooding, and the shipworm epidemic punctuated an era defined by economic stagnation as well as moral and cultural concern about the declining state of the Netherlands. Compared to these earlier decades, however, the 1740s were exceptionally disastrous. The single most important reason was cattle plague, but no *single* reason fully explains Dutch cultural, medical, and institutional response to disaster during this era. The response to cattle plague in the 1740s and 1750s only makes sense in the context of other calamitous events in the period of disaster.

"It is impossible to describe," one anonymous author proclaimed, "all of the disasters that have affected these lands and villages and misery and destruction and anguish that affect the people."¹²⁸ Written in 1741, this "Historical Description of Dearth and Famine" preceded the cattle plague by several years, but already characterized the 1740s as disastrous. The winter of 1739-1740 was particularly harsh. "I may be permitted to say that nobody has ever lived through such a noticeable year as this," the author declared.¹²⁹ This type of pronouncement was typical of descriptions for extreme weather in the early modern period, but other evidence largely supports

¹²⁸ Steeve van Esvelt, *Aanhangsel Van Eene Historische Beschryving Van Duure Tyden En Hongersnoden, En Wel Voornamentlyk Een Naaukeurig Vervolg Der Watervloeden, Die Ons Lieve Vaderland in 'T Laatste Van Den Jaare 1740 En in Den Beginnen Van Dit Jaar 1741 Zo Jammerlyk Getroffen Hebben, Doormengt Met Aanmerkelyke Gevallen En Gepaste Overdenkingen Om Den Zondaar Tot Inkeer Te Brengen ...: Vercierd Met Schoone Kopere Platen, Naar Het Leven Getekent* (Amsterdam: Arent van Huyssteen, 1741), 130.

¹²⁹ anon., *Een Historische Beschrijving Van Duure Tijden, En Hongersnoden* (Amsterdam: Arent van Huyssteen and Steeve van Esveldt, 1741), 184.

this assertion.¹³⁰ This winter was harsh enough to seriously affect grazing and the cattle trade. The Amsterdam writer Jacob Bicker Raye noted in his journal that even on 3 May 1740, it was still “bleak and cold.” Grass growth and the hay harvest were minimal that year due to the poor growing season. Raye noted the sharp increase in hay prices which went from 30 to 40 guilders/1000 pounds to 125-130 guilders in one week. “Hundreds of animals died of hunger,” he continued, “there was only rye bread available to keep them alive, but that was also considerably expensive.”¹³¹ The cold affected the entirety of the Netherlands and many citizens noted its effects on agriculture, from farmers to the urban upper class. In Utrecht, the city administrator Thadeus François Quint observed that the worst of the weather lasted up to May 23. Even the oldest people could not believe, he went on, that “after the strength of the winter, the spring remained incredibly cold.” Many livestock died, he concluded, because of this scarcity.¹³² Indeed, reports from Friesland noted 12,000 cattle deaths and those from Groningen 17,000.¹³³ This extreme weather disaster was problematic for the cattle trade. Animals that should have been fattened in Dutch meadows instead starved to death and needed to be replaced.

In Holland, the first institutional export restrictions of the 1740s did not occur because of cattle plague, but because of frost and floods. The provincial government restricted the export of cattle and the slaughter of calves between 1741 and 1743 in order to increase the herds. This was

¹³⁰ The first half of the eighteenth century was remarkably mild, especially when compared to the climatic regime immediately preceding it. The two exceptions, the winters of 1708/09 and 1739/40, were certainly extreme, though they would not have been uncharacteristic of the earlier climatic regime. Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 683.

¹³¹ Jacob Bicker Raye, *Het Dagboek Van Jacob Bicker Raye, 1732-1772 : Naar Het Oorspronkelijk Dagboek Medegedeeld*, ed. F. Beijerinck and Michiel George de Boer (Amsterdam: H.J. Paris, 1935), 79.

¹³² Thadeus François Quint. *Nieuwe Tijdingen , Aantekeningen Betreffende Gebeurtenissen Uit De Jaren 1733-1744*. 1744. C. Berger, als burgemeester van Utrecht. 753. 127. Utrecht Archief, 67.

¹³³ anon., *Een Historische Beschrijving Van Duure Tijden, En Hongersnoden*, 195.

partly due to the killing frosts, but also because of an exceptionally large rainfall and river flooding in South Holland during the winter of 1740/41.¹³⁴ These floods actually resulted from an accumulation of small dike breaches over the course of several months. The Catholic priest Godfridus Ram noted in his Baptismal book that by Christmas Eve of 1740, “already 30 villages are under water,” but continued to record dike breaches into May the following year.¹³⁵ Visual source material confirms the scope and severity of this compound disaster. The print “Aggrieved Netherlands” (Figure 5.7) employed quintessentially disaster-era visual cues to highlight the seriousness of this “second Christmas Flood.” It contrasted the local impacts of drowning livestock and the providential rescue of individuals (including a child in a cradle), with the broader scale map of the flood regions and its dike breaches. Importantly, this was an image of inversion. Floodwaters cover nearly every piece of land, turning productive fields into a watery expanse. As if to underscore this point, one victim falls, upside down, from a broken branch. This “Second Christmas Flood” was destructive, but doubly miserable because it followed so closely on the heels of the previous winter’s cold. “Similar dike breaches and floods over dikes always bring lots of misery and poverty,” Reformed minister Anthonie van Hardeveldt noted, but this flood was worse, because it followed an extremely hard winter and lengthy time of deprivation.”¹³⁶ Extensive and severe flooding in the river lands only added to the troubles facing Dutch farmers.

¹³⁴ Gijsbers, *Kapitale Ossen: De Internationale Handel in Slachtvee in Noordwest-Europa (1300-1750)*, 93.

¹³⁵ Ram, “Dooopboek of Godefridus Ram,” 7.

¹³⁶ Anthonie van Hardeveldt, *De Verbaasde En Erbarmlyke Vlucht Der Inwoonderen Des Landts Van Heusden, Wegens De Laatste Verschrikkelyke Overstrominge, Vertoont in Eene Predikatie, over Matth. Xxiii: Vers 20: Met Een Dank-Addres Aan De Chasidim of Weldadigen* (by Fredrik Oudman, 1741), 13.



Figure 5.7 *Dike breach by Elden (Dijkdoorbraak bij Elden, 1740) Jan I' Admiral, 1741*. This image depicts dike breaches and drowned villages along the Rhine and Lek rivers during the “Second Christmas Flood” of 1740–41. This composite image depicts multiple scales of the disaster and includes several symbols common to Dutch flood imagery such as the baby in the cradle. These floods were devastating because they followed in the wake of an unusually harsh winter.

Severe frosts and floods tested Dutch resilience in the early 1740s, but the centrality of cattle in disaster documentation throughout this period of disaster is a testament to their importance, not only for the rural population, but the urban population as well. "It is not only the farmer," one anonymous pamphleteer noted in 1745, "but also the city dweller who is affected, it is true that the poor man no longer makes a *stuiver*, a blow that strikes him first, and truly the most, but I ask what is the country or house without livestock...how can the common land, get its treasure and taxes?"¹³⁷ The cattle trade for beef, dairy production, and the numerous professions dependent on cattle products collectively constituted an important sector of the Dutch economy. These economic impacts did not escape the notice of provincial governments. Their export restrictions highlighted the need to replenish stocks even prior the arrival of the plague. Ironically, this increased demand for outside stock likely affected the introduction of the disease within the Netherlands.

Price fluctuations were a tangible effect of the loss of cattle in cities so far removed from the countryside. Jacob Bicker Raye noted during the second wave of cattle plague, for example, that the "loss of cattle continued and the price of milk steadily increased. For a liter of sweet milk [I] must pay more than three *stuivers*."¹³⁸ The close association of prices with these instances of plague is highlighted in the below figure. (Figure 5.8) It is easy to note the close relationship between periods of economic instability and the destabilizing forces of environmental disruption affecting the Dutch countryside. The economic troubles of the countryside affected other sectors of the economy and connected to larger issues of poverty and

¹³⁷ *Het Sugtende Neederland Onder De Slaande Hand Gods, over De ... Sterfte Van Het Rund-Vee En Den ... Oorlog*, ('s Hertogenbosch: H. van Irhoven, 1745), 6.

¹³⁸ Raye, *Het Dagboek Van Jacob Bicker Raye, 1732-1772 : Naar Het Oorspronkelijk Dagboek Medegedeeld*, 119.

regulation. "When these deaths of the cattle first appeared," Godefridus Ram noted, "no one was allowed to skin them, but were required to bury them in the earth, still this requirement was taken back and they are now allowed to be skinned, the fat was sold to the candle makers, and the meat was eaten by many people."¹³⁹ These desperate reactions occurred upon the arrival of the plague rather than after years of hardship resulting from it. This indicated a longer provenance of hardship related to prior disasters.

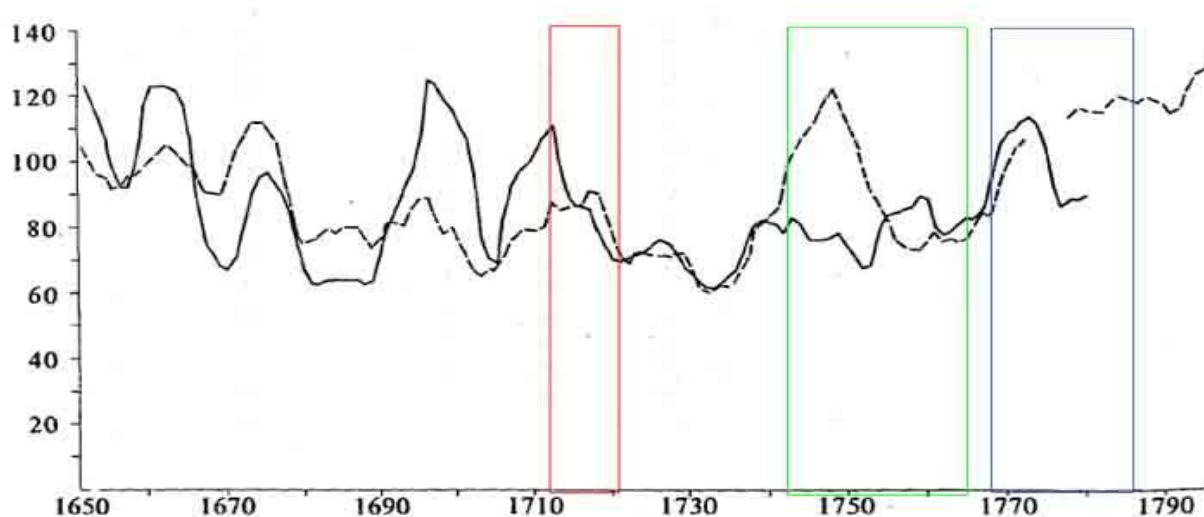


Figure 5.8 Cattle plague's relationship to dairy prices. The three boxes indicate the three episodes of cattle plague. The dotted line signified the rolling seven-year average of white cheese prices. The solid line represents rye on the grain exchange. The period 1651-1674=100. Figure adapted from: H.K. Roessingh, "Landbouw in de Noordelijke Nederlanden 1650-1815." *Algemene geschiedenis der Nederlanden* 8 (Haarlem, 1979), 18.

This era of multiple disasters also influenced the medical interpretation of cattle plague. Hippocratic medicine had long acknowledged environmental variables to be important variables in the diagnosis and treatment of disease. Many physicians identified miasmas emanating from moist or rotting material as the source of disease. One of the earliest contributions to the study of

¹³⁹ Ram, "Dooptboek of Godefridus Ram," 63.

cattle plague was from an anonymous physician in 1744. This account attributed the cause of the disease to the large amounts of dead mice rotting in the fields.¹⁴⁰ This anonymous doctor, in other words, located cattle plague's origin in the 1742 mice infestation. Many commentators interpreted the mice as a "plague," but this was a unique instance of an observer attributing them to an actual disease.

Many of the most direct connections between cattle plague and other disasters, however, derived from providentialist literature. Just as during the early outbreak, the Christmas Flood, and the shipworm epidemic, moralists placed the second outbreak of cattle plague in the context of past trials. Memory of past disasters extended throughout the entire period of disaster. One anonymous pamphlet from 1745 bemoaned the re-arrival of cattle plague in such close proximity to past disasters. "God," he argued, "has many times threatened our country and people with many plagues, just as in previous times, with worms and dearth, also high floods and a terrible mouse year that turned the entire country to food." In his short account of notable disasters, Jacob Pos aptly termed this period a "chain of punishments, one after another."¹⁴¹ Importantly, disasters not only indicated God's displeasure with individual sin, but the moral direction of the Netherlands as a whole. Nature-induced disasters were critical components of this providential interpretation, but wars and economic troubles were also "disasters." The moralist Koenraad Blom argued that God was punishing the Netherlands through "war, terrible storms that destroy many ships, floods, infectious fevers...boring worms that threaten to turn us into a sea...the destruction of many cattle, killing frosts, gnawing mice, [and] the lessening of navigation and

¹⁴⁰ Paimans, "De Veeartsenijkunde in Nederland Voor De Stichting Der Veeartsenijschool De Utrecht," 7.

¹⁴¹ J.F.C.Schlimme, ed., *Het dagoek van Jacob Pos* (Hilversum, 1992), 14.

commerce.” In the face of so many disasters, Blomraad conceded, “the Netherlands appears to have already reached its peak.”¹⁴² Anxiety about the decline and the future state of the Netherlands underlay much of the institutional and providential interpretation of cattle plague.

Conclusion

The second cattle plague epidemic was not simply an encore performance of the first. It lasted over twice as long and resulted in hundreds of thousands more animal deaths. The economic and environmental context partly explained its longevity and severity. From an economic perspective, the second outbreak deepened an already century-long agricultural depression affecting much of the western Netherlands. Areas like North Holland and Friesland had not yet rebounded from the economic consequences of the shipworm epidemic before the cattle plague hit. Pamphlet literature underscored the combined emotional and moral impact as well. In his providentialist pamphlet on the cattle plague, moralist Pieter Liesveldt bemoaned the loss of cattle “many thousands in number” but also the “flood in the year of seventeen [Christmas Flood]...the worms that though send upon us as punishment...and of the river floods that men in the south have so dearly felt, whereby many thousands of common people are reduced to a sad state of poverty.”¹⁴³ Providential and economic interpretations worked hand-in-hand as the cultural memory of disaster preserved the consequences of previous trials.

Providential and institutional responses to the second outbreak of cattle plague also displayed remarkable continuities. Providential commentators continued to advocate moral

¹⁴² Blom, *Hiskia's Dank- En Lof-Offert Voor Gods Wonderbare Genesing, Den Heere Toegebragt in Syn Dank-Schrift Jesaia 38 Vs. 16-20.*, 3-4.

¹⁴³ Liesveldt, *Neerlands Oordeel, Ofte Levendig Vertoog Van De Slaande Hand Gods, over De Bedroefde Sterfte Onder Het Rund-Vee. Voorgesteld in Een Saamenspraak* (Nieuwkoop: Joh. van Abkoude, 1745), 6.

solutions to what they believed was ultimately divine retribution. Institutions supported this position, though their highest priority responses remained quarantine and import and export restrictions. The provinces continued to struggle to find a balance between supporting the cattle economy and compensating for its vulnerabilities. The cattle economy, as much as the plague itself, depended on the movement of cattle and institutional management of disease continued to focus on restricting that movement. In some cases, the provinces simply reinstituted regulations from two decades earlier.

These striking continuities, however, belie the dramatically changed character of this era. Contemporaries may not have considered the plague itself novel (as they did with shipworms), but in terms of scope and severity, this was a new beast. Dutch response reflected those changes. Provincial governments in the 1740s broke new ground when they solicited expert advice from medical faculties at Utrecht and Leiden. Although some of the earliest European regulations of cattle plague came from physicians, prior to the outbreak in 1744, few Dutch physicians or surgeons contributed to this dialogue. This can be interpreted as either an increase in the confidence of authorities in academic medicine, evidence of the degree of desperation in the search for remedies, or perhaps both. Regardless, it underscored the expanding realms of institutional response by the 1740s.

The expanding state relationship with physicians and academic medicine was not the only change in medical response. Secular remedies enjoyed greater visibility in newspapers, pamphlets, and other popular media. This trend may have been due to the desperate need for effective remedies during this more severe outbreak, but it may also have foreshadowed the general enlightenment secularization of medicine that developed more fully in the late eighteenth century. To a limited extent, medical practitioners independent of universities or provincial

invitation also participated in dialogues regarding animal medicine and by the 1750s, the first Dutch academy of science began promoting their own investigations of cattle plague. These trends were derivative of a gradual professionalization, early enlightenment rationalism, and increasing scientific interest in animal medicine despite persistent anxiety about its social status.

Conflict over inoculation experiments demonstrated new emphasis on exclusivity in the crafting of causal stories. Exclusive providentialism made only rare appearances in earlier disasters. Opponents of inoculation (at least according to proponents) argued that the technique undermined God's will and challenged experimentation on moral grounds. It is tempting to interpret this conflict over inoculation in the context of enlightenment-era secularization. Indeed, cultural historian Jan Buisman argued that the "self-evidentness" of punishment theories of cattle plague causation lessened over the course of the eighteenth century.¹⁴⁴ The persistent popularity of providential interpretations of disaster well into the nineteenth-century, however, complicates any fundamental (or permanent) shifts in the relationship between secular and spiritual responses, or their use of causal stories. These new developments in providentialism and animal medicine were not merely a battle over territory; they reflected fundamentally different ways of dealing with catastrophe. Cattle inoculators displayed an optimistic rhetoric typical of early enlightenment medicine, but also reminiscent of technocrats like Thomas van Seeratt, Pieter Straat, and Pieter van der Deure. For these figures, the period of disaster was an opportunity. For many, however, this era was defined by what it no longer was: a pastoral Golden Age.

¹⁴⁴ Buisman, *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En -Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)*, 143.

Chapter 6. *Ongelukkige Tijden* – The Post Golden Age Period of Disaster

Between 1672 and 1764, the United Provinces endured repeated nature-induced disasters.¹ Cattle plague ravaged Dutch agriculture, major coastal and river floods inundated previously productive landscapes, extreme weather like storms and frosts affected cities and the countryside, and shipworms incited panic and required massive expenditures. Thus far, this project has focused on dramatic and destructive disaster events. This perspective foregrounded many of the unique conditions that determined the severity and extent of damage, as well as historically contingent factors that determined Dutch response. Without this case-specific approach, it would be difficult to interpret the significance of Thomas van Seeratt's optimistic technocratic rhetoric (or the value of causal storytelling more generally regarding Dutch response to adversity). It would be hard to account for the high mortality of the second cattle plague epidemic or the sudden explosion of shipworms without considering the immediate environmental and economic conditions that conditioned them. It would also be challenging to explain provincial policies during the first outbreak of cattle plague that seemed to encourage proliferation of the disease. For historians, event-based interpretations ground disasters in the context and contradictions of social and environmental moments.

Disasters are also processes, however. From a historical perspective, they represent the cumulative outcome of long-term environmental and cultural changes. The disaster event, in this frame of analysis, becomes one crystallizing moment in a longer negotiation of natural and

¹ See Appendix I.

cultural relationships. The early modern Dutch interpreted disasters as processes as well. They employed a cultural memory of disasters to organize discrete events into longer stories of tribulation and moral punishment. They also recognized that disasters had cascading economic consequences that multiplied with each successive event. Finally, contemporaries discussed environmental connections between disasters, particularly those that revealed long-term disequilibrium between natural and cultural systems. Each of these elements reflected larger concerns about Dutch decline that emerged in the wake of the 1672 “year of disaster.”

The process-based approach to disaster history has increased in profile over the last twenty years. Recent trends in historical disaster research stress this perspective by favoring cumulative experience that produced “cultures of coping” or “disaster-induced learning” from repeated experience of disasters.² This trend has encouraged the integration of cultural memory, tradition, and folklore into histories because these subjects offer valuable insights into longer-term perspectives on disaster perception and response.³ These elements are oftentimes absent from event-centered historical and (until recently) social scientific theories of disaster-induced change.⁴ Similarly, the disaster-as-process approach invites fuller discussions of environmental

² Greg Bankoff, *Cultures of Disaster: Society and Natural Hazard in the Philippines* (New York: Taylor & Francis, 2003); Christian Pfister, “Learning from Nature Induced Disasters,” in *Natural Disasters, Cultural Responses: Case Studies toward a Global Environmental History*, ed. Christof Mauch and Christian Pfister (New York: Lexington Books, 2009). Juneja and Mauelshagen identify this trend as a third dimension of historical disaster research in: Monica Juneja and Franz Mauelshagen, “Disasters and Pre-Industrial Societies : Historiographic Trends and Comparative Perspectives,” *The Medieval History Journal* 10, no. 1&2 (2007), 6.

³ Bernd Rieken, *“Nordsee Ist Mordsee”: Sturmfluten Und Ihre Bedeutung Für Die Mentalitätsgeschichte Der Friesen* (Münster: Waxmann Verlag, 2005).

⁴ Notable recent exceptions are Valérie November, Marion Penelas, and Pascal Viot, “When Flood Risk Transforms a Territory: The Lully Effect,” *Geography* 94, no. 3 (2009): 189-97; Clare L. Johnson, Sylvia M. Tunstall, and Edmund C. Penning-Roswell, “Floods as Catalysts for Policy Change: Historical Lessons from England and Wales,” *International Journal of Water Resource Development* 21, no. 4 (2005): 561-75.

conditions in analyses of vulnerability, the development of comparative models of historical disaster, and evaluation of long-term environmental elements like climate.⁵ Additionally, a long-term perspective displaces the oftentimes unwieldy explanatory burden of historical change from a singular event to a process. This opens up the possibility that even the most devastating events sometimes yielded limited change.⁶ Finally, interpreting disasters in the long-term perspective opens potential explanatory pathways to sources that seem incongruous or contradictory (Figure 6.1).

⁵ The "amphibious society" approach highlights the popularity of this focus on the environment and the trans-national. It refers to shared cultural, social and technological behaviors and adaptations to the hazardous situation of living in a flood-prone landscape. Technology and cultural strategies of coping are usually foregrounded. Many prominent scholars have taken up this regionalist approach, though they are usually grounded in one primary location. Michael Kempe and Franz Mauelshagen's arguments draw primarily on German sources, Greg Bankoff on Eastern England, and Simon Schama and Petra van Dam on the Netherlands. See: Michael Kempe, "Noah's Flood: The Genesis Story and Natural Disasters in Early Modern Times," *Environment and History* 9, no. 2 (2003): 151-71; Franz Mauelshagen, "Flood Disasters and Political Culture at the German North Sea Coast: A Long-Term Historical Perspective," *Historical Social Research / Historische Sozialforschung* 32, no. 3 (121) (2007): 133-44; Greg Bankoff, "The 'English Lowlands' and the North Sea Basin System: A History of Shared Risk," *Environment and History* 19, no. 1 (2013): 3-37; P.J.E.M. van Dam, "De Amfibische Cultuur: Een Visie Op Waternoodrampen," in *Faculteit Letteren, Inaugural Lecture* (Amsterdam: Vrije Universiteit Amsterdam, 29 October, 2010), summarized in "An Amphibious Culture. Coping with Floods in the Netherlands," in *Local Places, Global Processes: Histories of Environmental Change in Britain and Beyond*, ed. Peter Coates, David Moon, and Paul Warde (Oxford: Windgather Books (in press). From the perspective of historical climatology: H. H. Lamb and Knud Frydendahl, *Historic Storms of the North Sea, British Isles and Northwest Europe* (New York: Cambridge University Press, 1991); Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006).

⁶ Georgina H. Endfield et al., "Documenting Disaster: Archival Investigations of Climate, Crisis, and Catastrophe in Colonial Mexico," in *Natural Disasters, Cultural Responses: Case Studies toward a Global Environmental History*, ed. Christof Mauch and Christian Pfister (New York: Lexington Books, 2009), 316. This process-driven approach forms the core structure of Marie Luisa Allemeyer, *"Kein Land Ohne Deich--!": Lebenswelten Einer Küstengesellschaft in Der Frühen Neuzeit* (Göttingen: Vandenhoeck & Ruprecht, 2006). This evaluates flood engineering, risk culture, and social response in the long-term.



Figure 6.1 Anon. *Hard Winter of the Year 1740* (Harde Winter van het Jaar 1740). This image inverts the Golden Age winter landscape symbolism of the previous century. In contrast to the playful scenes of the middle and foreground, the background is littered with images of hardship including dead birds, a man hanging, dying cattle, and empty hay barracks. From: *A historical account of many...events that occurred during different hard winters, especially those of the years 1709 and 1740. (Een historiesch verhaal van veele [...] voorvallen, die geschiet zyn in verscheide harde winters, inzonderheid die van den jaare 1709. en 1740).* Amsterdam: A. van Huyssteen en S. van Esveldt, 1740.

This anonymous print depicting the “harsh winter” of 1740 is a case in point. It appears to contradict the prevailing historical narrative about this episode of extreme weather. The winter of 1739/1740 was one of the harshest of the era according to contemporaries and it affected much of Europe.⁷ In the countryside, those cattle that did not freeze, starved the following spring from poor grass production. This situation became so dire that some provinces struggled to deal with the multitude of corpses. “In these *ongelukkige tijden* (unhappy times),” one Groningen proclamation declared, “many animals die, and lay unburied on the lands, roads, and elsewhere.”⁸ The winter was no less severe in cities, where lack of fuel and astronomical food prices created widespread suffering. In his journal, Jewish chronicler Abraham Chaim Braatbard noted the difficulty of obtaining fresh water in Amsterdam. Already by the sixteenth century, pollution prevented inhabitants from drinking canal water, which had to be imported from local rivers as a result.⁹ During the winters, icebreakers kept open access to fresh water, but the temperatures of 1739/40 were so severe that they could not keep up with demand. “Every bucket of water cost 2 ½ bas, and one bucket of ice 1 ½ bas,” Braatbard stated, “and men fought everywhere” for them.¹⁰ Most assessments of this period focus on this interplay of environmental and economic difficulties.

⁷ For more on the Dutch accounts of the frost of 1739/40 as well as a sampling of the broader European experience, see: Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 665-696.

⁸ *Plakaat (13 May) 1740*. Staten van Stad en Lande. 1. 478. Groninger Archieven.

⁹ G.P. van de Ven, *Leefbaar Laagland: Geschiedenis Van De Waterbeheersing En Landaanwinning in Nederland*, International Commission on Irrigation and Drainage. Nederlands Nationaal Comité (Utrecht: Uitgeverij Matrijs, 2003), 147.

¹⁰ Abraham Chaim Braatbard and Lajb Fuks, *De Zeven Provinciën in Beroering: Hoofdstukken Uit Een Jüddische Kroniek over De Jaren 1740-1752 Van Abraham Chaim Braatbard* (Amsterdam: Meulenhoff, 1960), 9; Rudolf Dekker lists a “drinking water uprising” as the first of fourteen popular revolts between 1740 and 1741. Rudolf Dekker, *Holland in Beroering: Oproeren in De 17de En 18de Eeuw* (Baarn: Ambo, 1982), 23.

Little of this dismal portrayal is immediately evident in *Harde Winter*, however. Smiling, well-dressed figures populate the middle and foreground, seemingly enjoying the harsh winter weather. In the foreground, a couple takes a leisurely carriage ride pulled by a plumed horse across a frozen canal. Skaters with hand muffs glide across the middle ground and a father smokes his pipe while pushing his child in a sled. This idyllic scene points to an alternate perspective about the experience of harsh cold. Despite the fact that winter weather hindered travel along roads or on passenger barges, winter-adapted sled and sleigh traffic took up some of this slack. On 26 February 1740, for instance, over 160 sleds arrived in North Holland from Friesland, having traveled across the frozen Zuiderzee. Reports in newspapers and pamphlets noted a festive atmosphere where “every day is like *kermis* (fair) because so many people came on the ice” and when compared to previous winters, one observer noted “the skaters and the sleigh riders could not have had as much entertainment.”¹¹ This interpretation invites the viewer to discard any uniform characterization of the winter of 1740 and points to the importance of cultural resilience and examining events in their own context.

This print also demonstrates the value of integrating disaster events (and sources derived from them) into longer-term interpretations. Despite its immediate appearance, “*Harde Winter*” is not a celebration of winter escapism. In fact, it inverts the symbolism of a venerable pictorial tradition of winter landscape artwork that experienced its heyday during the Golden Age of the Netherlands. The Dutch winter landscape tradition, epitomized by painter Hendrick Avercamp in

¹¹ Nicolaas Duyn, *Aanmerkingen En Aanteekeningen Van Drie Meer Dan Gemeene Strenghe Winters: Als Die Van Den Jaaren 1708 En 1709, Die Van 1739 En 1740, En Die Zeer Strenghe Wintermaand Van 1742, Als Meede Meer Andere Nuttig-Weetende Zaaken* (Haarlem: Izaak Vander Vinne, 1744)., 30. Duyn cites an article from the *Opregte Haarlemse Courant* on March 1, 1740.

the first half of the seventeenth century, often depicted visually similar scenes of life on the ice. (Figure 6.2) This genre peaked during the height of Golden Age prosperity, some of the coldest points of the Little Ice Age.¹² Indeed, the lack of hardship displayed in this genre (especially the festival-like atmosphere of Avercamp's compositions) hints at the adaptability and resiliency of the Golden Age Dutch to the winter adverse conditions of the Little Ice Age.

¹² Several historical climatologists have investigated the winter landscape tradition as a direct reflection of the colder periods of the Little Ice Age. See, for example, H. H. Lamb, *Climate: Present, Past, and Future, Vol. 2* (New York: Barnes and Noble, 1977); Hans Neuberger, "Climate in Art," *Weather* 25(1970): 46-56; W.J. Burroughs, "Winter Landscapes and Climatic Change," *ibid.* 36(1981): 352-57; Peter J. Robinson, "Ice and Snow in Paintings of Little Ice Age Winters," *ibid.* 60, no. 2 (2005): 37-41. Their conclusions have increasingly come under criticism, however, both because of timing and because of the multiple variables that may have contributed to the development of this genre. See: Dagomar Degroot, "The Frigid Golden Age: Experiencing Climate Change in the Dutch Republic, 1560-1720" Diss. York University, 2014.



Figure 6.2 Avercamp's depiction of a winter day shares similar figures to "Harde Winter." People skate together, a well-dressed couple take a sleigh ride pulled by a plumed horse, and parents push their children in sleds. There are no explicit indications of hardship on animals or humans, as birds fly instead of fall from the sky. Hendrick Avercamp, "A Scene on the Ice," ca. 1625. *National Gallery of Art*. Washington D.C.

“Harde Winter” mimics some of the visual cues from this earlier body of work, but subtly inverts them by juxtaposing them against a background littered with signs of hardship. In the middle ground, for instance, a healthy cow stands complacently next to two dead cattle, both lying emaciated on the ground. The hay barrack (*hooiberg*) immediately behind the cattle stands empty – a poignant reminder of that winter’s detrimental impact on winter fodder production. The clearest indications of human hardship are in the upper left corner where a man hangs from a tree with a rope bound around his neck, likely from suicide. A female figure next to him lifts her hands to her head in grief. Above her and to the right, birds tumble frozen from the sky. This trope was common to narratives of extreme winter weather during this era of disaster. Referring to the harsh winter of 1708/09, for instance, Gerrit Jacobsz Nen noted, “it was so cold that the birds fell, frozen and dead out of the air.”¹³ To underscore the providential conjuncture that causally connected this human and animal suffering, a comet streaks overhead (likely the same discovered during the summer of 1739), ominously portending future disasters.¹⁴ Even the skaters in the foreground may speak to soberer themes. Golden Age artists sometimes employed skating as an allegory; skating over “thin ice” represented recklessness and the transience of life.¹⁵ In any case, the stark contrast between superficial gaiety and tragedy in the background undermines and inverts the seeming Golden Age optimism.

¹³ Gerrit Jacobsz. Nen. *Aantekeningen Betreffende Het Weer En De Gevolgen Daarvan, Overlijden En Andere Familieberichten over Kennissen En Familie, Gebeden, Gelegenheidsrijmen, Spreuken Enz. Enkele Bladzijden Zijn Uitgescheurd*. 1742. 10. 147. Gemeentearchief Zaanstad.

¹⁴ Gary W. Kronk, *Cometography: Volume 1, Ancient-1799: A Catalog of Comets* (Cambridge: Cambridge University Press, 1999), 402-403.

¹⁵ Ariane van Suchtelen, ed. *Holland Frozen in Time: The Dutch Winter Landscape in the Golden Age* (Zwolle: Waanders, 2001), 16-20.

“Harde Winter” demonstrates the importance of evaluating disasters in the short and long term. On the one hand, the disaster event of 1740 had terrible consequences for contemporaries in the city and countryside. Extreme winter weather could be deadly for people and animals and had serious short-term economic consequences. Despite these conditions, some sources highlight its positive dimensions. Evaluating disasters from an event-perspective highlights these contradictions. In previous chapters, the disasters event perspective added complexity to the larger history of professionalization in engineering and medicine as well as disaster-induced learning. This reading of “Harde Winter” suggests the value of a similar approach when interpreting cultural adaptation and contemporary narratives of uniform Dutch decline.

On the other hand, disasters were also long-term processes that deserve contextualization. When compared to what some contemporaries (and historical climatologists) considered the harsher winter of 1708/09, the winter of 1740 seemed relatively benign, warranting a rosier depiction of the event. The benefit of this perspective extends to historians as well. Seemingly contradictory sources like “Harde Winter” only make sense in the longer context of Dutch cultural response to extreme weather. Whereas winter landscapes in the Golden Age highlighted the extraordinary adaptability of the Dutch to their environmental circumstances, “Harde Winter” inverts these meanings. This shift reveals the changed manner in which the Dutch relationship with their environment reflected the declining cultural and economic milieu of the eighteenth century.

This final chapter seeks to interpret disasters as processes in the context of Dutch decline. Many disasters of the late seventeenth and eighteenth centuries had compounding significance when viewed in the longer term. Floods, worms, and cattle plague were not the only disasters between 1672 and 1764. In addition to multiple wars and economic recession, the Dutch

contended with harsh winters, mice plagues, river and coastal flooding, and numerous other nature-induced disasters. Scholars have largely treated these disasters as individual, restricted occurrences that affected Dutch society and the economy on a local and regional scale. This chapter will interpret this period of disaster as a unified whole, re-centering floods, worms, and cattle plague in the context of an era of post Golden Age decline that both included and transcended these events.

This chapter also lays out the multiple factors that defined the period between 1672 and 1764. Contemporaries often acknowledged that they were experiencing a unique confluence of disastrous events. Providentialists dominated this discourse and frequently treated ongoing catastrophes as part of a longer shared experience of disaster, sometimes extending those connections into the deep past, but far more commonly to disasters following the *rampjaar* of 1672. This pessimistic cultural context fixated on moral decay, inversion, and decline and reflected the deteriorating economic condition of the United Provinces. Contemporaries also treated disasters self-referentially. Floods, shipworms, and cattle plague along with a varied assortment of lesser disasters emerged and reemerged in disaster literature, reinforcing the providential rhetoric even decades after their occurrence.

Nature-induced disasters during this era all occurred during a discrete moment of economic history, a secular trend of economic recession lasting from roughly 1650 to 1750. This economic context influenced policy decisions via the social and institutional negotiation of multiple risks. Each new disaster event exacerbated the financial burden on populations still rebuilding in the wake of earlier catastrophes. In the case of the severe winter of 1739/1740, for instance, decades of agricultural recession punctuated by repeated river and coastal flooding and the shipworm epidemic limited the ability of the population to cope.

Finally, the changing environmental context of the late seventeenth- and early eighteenth-centuries created new or increasing vulnerabilities. Contemporaries understood that disasters developed out of historic changes in the environment, some directly caused by people and others caused by disasters. The weight of some environmental changes combined with economic recession to limit Dutch ability to refashion the environment as they had during the Golden Age. Other long-term environmental changes created new disaster vulnerabilities into the eighteenth century. Finally, although largely unrecognized by contemporaries, climate change defined the period of disaster between 1672 and the 1764. This era coincided with a transition from one climate regime to another. This pivot period was characterized by climatic variability and extreme events. The conjuncture of cultural, economic, environmental, and climatic conditions formed a synergy that produced this period of disaster.

A Culture of Disaster

Eighteenth century observers were well aware that they lived during an era removed from their Golden Age past. Some, as described in chapter one, specifically dated this transition to the disaster year of 1672. The dramatic confluence of military defeat and social unrest during the *rampjaar*, the windstorm of 1674, and the floods of 1675 left an enduring impression in Dutch cultural memory. According to cultural historian Simon Schama, it was “the second great historical watershed in the life of the independent Dutch nation.”¹⁶ These events had long-lasting consequences, which in combination with the memory of this shocking episode extended its relevance well into the eighteenth century.

¹⁶ The first being the Dutch Revolt of the sixteenth century. Simon Schama, *The Embarrassment of Riches : An Interpretation of Dutch Culture in the Golden Age* (New York: Knopf, 1987), 286.

Pamphleteers throughout the period of disaster used the *rampjaar* to their advantage, emphasizing its providential connectedness to ongoing troubles. The meanings ascribed to the disaster year changed over time, however. Golden Age depictions of disasters and extreme weather such as Romein de Hooghe's *Ellende Klacht van de Bedroefde Nederlandt* (Figure 1.1) and Hendrik Avercamp's "A Scene on the Ice" (Figure 6.2) revealed a Dutch resilience indicative of Golden Age optimism. By the mid-eighteenth century, however, little of this optimism remained. Post-Golden age literature tended to relate series of disasters to cultural anxieties about Dutch decline. Moralists continued to cite the disaster year, but did so pessimistically. Any perceived rebound in the state of Dutch Republic following the shock of 1672 was only a further example of Dutch pride and unwillingness to learn from providential lessons. "Already this century, you were admonished with war," one pamphlet on the shipworm epidemic noted, "the French army struck with sharpened cock's spurs at Holland's Lion, and the moon of its fortune waned, but came victoriously back with a fuller shine than before...the Christmas Flood followed... [and]the stubborn heart stood tall," but then the "milk cow, that stood with swollen udder, was lost amidst the despair of frightened farmers."¹⁷ This litany of punishments culminated in the shipworm epidemic, which the author described (in contrast to De Hooghe's triumphalist optimism) as stemming from persistent sins "threatening the entire corruption of Church and State."¹⁸

¹⁷ L. T and J. B, *Nederlant Ten Toneele, Van Godts Regtvaardige Wormstraf Gekozen* (Groningen: Laurens Groenewout, 1732), 7.

¹⁸ *Ibid.*, 8.

Not all authors connected the beginning of these catastrophes back to 1672, however. Gerhardus Outhof's monumental compendium of floods, for instance, extended across biblical and secular history; Simon Gabbema's compendium of floods traced them back to the Roman era; and Hendrik van Byler's history of cattle plagues extended to Moses' plagues of Egypt in an effort to establish ancient precedent.¹⁹ Even in these longer chronologies, however, authors privileged the more recent past. Van Byler began his 1719 account by noting the many different disasters that had recently occurred, including a "consuming war, which our land still feels today to no small degree," followed by "a pestilential sickness," "terrible famine," as well as storms and floods. Environmental disasters seemed to be getting worse. "Histories deliver us a whole multitude of similar diseases," Van Byler noted, though it "is not known to us, which can match this present one in its generality and duration." These disasters had profoundly declensionist implications as well. The 1714 outbreak of cattle plague, Van Byler declared, "snatched away an unbelievable number of animals in previous years" which "stripped the fields, weakened the sinews of the tottering state, and pushed the inhabitants into a great state of poverty."²⁰ Van Byler's fears about the consequences of these combined disasters clearly indicates that anxieties about decline existed already by 1719, and that nature-induced were considered integral to this sensibility.

¹⁹ Gerhardus Outhof, *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden, in Meest Alle Plaatsen Van Europa, Van Noachs Tydt Af, Tot Op Den Tegenwoordigen Tydt Toe: Met Een Nieuw Kaertje Van't Verdrongen Landt in Den Dollaart, Afbeeldinge Van Kosmas En Damianus En Van Den Steenenman in Vrieslandt: Met Eene Breede Beschryvinge Van Den Zwaaren Kersvloedt Van 1717, En Bygevoegde Tafels Der Watervloeden* (Embden: H. van Senden, 1720). Simon Abbes Gabbema, *Nederlandse Watervloeden, of Naukeurige Beschrijvinge Van Alle Watervloeden Voorgevallen in Holland ... En De Naaburige Landen* (Gouda: Lucas Cloppenburg, 1703). Hendrik Carel van Byler, *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. (Groningen: Jurjen Spandaw, 1719).

²⁰ *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. (Groningen: Jurjen Spandaw, 1719), 46.

Disaster narratives also highlighted later hostilities, in effect extending *rampjaar* conditions into the eighteenth century. In his 1746 sermon on the cattle plague, minister Koenraad Blom related forgotten lessons back to both 1672 and the War of Spanish Succession (1702-1714), once again demonstrating the close connections between war and nature-induced disaster. “Has our righteous God not also threatened us with the consuming sword of war, the great rod of God whose points we have felt in the year 1672 and have seen in the year 1702.”²¹ Indeed, Blom wrote amidst yet another continental conflict, the War of Austrian Succession (1740-48), when France once again invaded the southern Netherlands. The ease with which the French overran Dutch defenses in 1744 prompted many comparisons to the *rampjaar*.

Even authors that did not point to a specific beginning of this period of disaster tended to limit their scope to a select few decades and types of disaster. The cattle plague epidemics, the Christmas Flood of 1717, and the shipworm epidemic received by far the most attention. Other commonly noted disasters included the mouse plagues of the 1740s, extreme weather like drought or winter storms (especially in 1708/09 and 1739/40), the river floods of 1740/41, and the depressed state of the economy and overseas trade. Following the wars of 1672 and 1702, for instance, Koenraad Blom noted a number of events connected to the cattle plague outbreak of 1744 including “terrible storms,” “floods,” “infectious fevers,” “worms,” “droughts,” “hard frosts,” “gnawing mice,” and “the lessening of navigation and commerce.”²²

²¹ Koenraad Blom, *Hiskia's Dank- En Lof-Offert Voor Gods Wonderbare Genesing, Den Heere Toegebragt in Syn Dank-Schrift Jesaia 38 Vs. 16-20* (Amsterdam: Adrianus Douci, 1746), preface, 4.

²² *Ibid.*, preface, 3-4.

For the vast majority of observers, each subsequent disaster became a new link in a chain of providential causation indicating punishment and moral decay. Following the declaration of a provincial day of thanks, fasting, and prayer in Groningen to combat the shipworm plague, the minister Jacob Harkenroht reminded his parishioners of the "many previous exceptional and repeated disasters" that had recently befallen the Netherlands.²³ While some of these disasters extended into the deep past, for Harkenroht, a striking number of truly devastating events had occurred over the past two decades, including flooding, cattle plague, "poverty, hunger, warfare, and crop failure."²⁴ In fact, *Worm in Nederlands Paalwerk* was Harkenroht's third book to profile catastrophe during the period of disaster. He had previously published extended, explanatory sermons on the Christmas Flood of 1717 and the first wave of cattle plague.²⁵ Harkenroht's production mirrored broader trends in contemporary disaster literature that linked events together as part of longer-term processes demonstrating providential causation and decline.

An Economy of Disaster

The period of disaster conformed to what contemporaries believed to be an era of declining economic fortunes in the Netherlands. The reasons for Dutch economic decline were contentious –and have remained disputed ever since the mid-eighteenth century. Early political economists dominated the next wave of discussion during the last quarter of the eighteenth

²³ Jacobus Isebrandi Harkenroht, *Worm in Nederlands Paalwerk Voor De Zeedyken* (Groningen: Harmannus Spoomaker en Laurens Groenwout, 1733), 42.

²⁴ *Ibid.*, 50.

²⁵ *Kerkreede over Oostfrieslands Rundvees Pest, Gevreest, En Helaas Gekoomen, Aangetoont Uit Jes: Vii. Vs. 21. ... Op Een Maandelijke Bededag Aan De Gemeente Te Larrelt in Oostfriesland*, vol. 16305 (Embden: Enoch Brantgum, 1716); J.I. Harkenroht, *Kerkreede over Oostfrieslands Kerstvloed Den 25 December Des Jaars 1717 ... Op Den Eersten Zondag Des Jaars 1718, Den 2 Januaris Aan De Gemeente Te Larrelt Aan Den Eems in Ostfriesland, Nevens Een Kort Ontwerp Van Deezen Laasten Kersvloed 1717* (Embden: by H. van Senden, 1721).

century. Adam Smith, for instance, argued that Dutch decline was the result of high taxation on staple foods, whereas Johann Heinrich Gottlob von Justi argued it was the result of other European nations catching and surpassing the Dutch in manufacturing and trade. Another widespread explanation cited Dutch national character and argued that the Dutch declined due to laziness and a decadence born of the very success they experienced during their Golden Age.²⁶ This “Periwig Period” (*Pruikentijd*) argument later evolved into the dominant historiographical characterization of the eighteenth century.

Many of the arguments of later economists and historians drew on anxieties about decline already firmly established during the era of disaster. To a large extent, these discussions focused on international commerce and trade. For instance, Amsterdam’s regents, meeting in 1684 on the economic state of Holland, reported that commercial capital had been reduced by half since 1672. This was problematic, they argued, because trade financed public expenditures.²⁷ By the mid-eighteenth century, this discussion gained the national policy attention of the *Stadhouder* and the *Staten Generaal*. A specially convened selection of merchants and confidants of *Stadhouder* Willem IV resolved to investigate the causes of this decline and in 1751 issued a directive (*Propositie*) to the *Staten Generaal*. This document not only listed the fundamental underpinnings of Dutch trade success, but identified changes to those conditions that had yielded economic stagnation in the United Provinces. It listed moral, political, and environmental factors in an effort to elucidate “how, remarkably, the whole system of trade in Europe has since been

²⁶ Erik S. Reinert, "Emulating Success: Contemporary Views of the Dutch Economy before 1800," in *The Political Economy of the Dutch Republic*, ed. Oscar Gelderblom (Burlington, VT: Ashgate Publishing, 2013), 35-37.

²⁷ Jan de Vries and Ad van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815* (New York: Cambridge University Press, 1997), 679.

altered.”²⁸ Historians often cite this well-known document as evidence of Dutch preoccupation with reform during this era, such as its recommendations to lower import and export duties.²⁹

The account mentions natural disasters, but only as they were tangentially related to economic troubles. This was partly because it focused exclusively on the carrying trade, which in the view of the authors was “the chief origin of the rise and blossoming of the...Republic.”³⁰ Nature-induced disasters that affected domestic agricultural production, like coastal flooding for instance, went unexamined. Cattle plague and severe frosts that occurred in the previous decade were an exception, though their analysis approaches the significance of disasters obliquely. In fact, it identified a misconception that “the causes of the increasing of the country's income after the fatal winter of 1740” was not in fact because “domestic crop production needed to be replenished to a certain degree as a result of the severe frost that ruined the harvest.” Cities, according to this rationale, imported extra goods into the country to compensate for the lack of a harvest, which resulted in an increase in trade. Import duties on this trade benefitted some, including tax farmers, but those costs were passed on to consumers. This same principle applied to cattle plague and the resulting increases in especially dairy products. “The Republic,” the authors wryly concluded, “truly could not stand these sorts of so-called flourishing years.”³¹

²⁸ *Propositie Van Syne Hoogheid Ter Vergaderingen Van Haar Hoog Mogende En Haar Edele Groot Mog. Gedaan, Tot Redres En Verbeeteringe Van Den Koophandel in De Republicq* ('s Gravenhage: Jacobus Scheltus, 1751), 10-11.

²⁹ Koen Stapelbroek, “Dutch Decline as a European Phenomenon,” *History of European Ideas* 36, no. 2 (2010): 139-52., 147-148. The rubric and explanation for decline outlined in this document largely defined the eighteenth-century discussions and debates about combatting stagnation.

³⁰ *Propositie Van Syne Hoogheid Ter Vergaderingen Van Haar Hoog Mogende En Haar Edele Groot Mog. Gedaan, Tot Redres En Verbeeteringe Van Den Koophandel in De Republicq*, 25.

³¹ H.K. Roessingh, “Landbouw in De Noordelijke Nederlanden, 1650-1815,” *Algemene Geschiedenis der Nederlanden* 8(1979), 18; *Propositie Van Syne Hoogheid Ter Vergaderingen Van Haar Hoog Mogende En Haar Edele Groot Mog. Gedaan, Tot Redres En Verbeeteringe Van Den Koophandel in De Republicq*, 25-26.

Evidently, some recognition existed that an increase in trade might not be a panacea if accompanied by disaster.

Modern economic historians offer nuanced perspectives on the subject of Dutch decline and generally downplay the role of cultural factors. The 1980s and 1990s, in particular, witnessed a lively debate regarding the origins of Dutch decline, its timing, and its relative or absolute status as part of a project to produce a complete vision of the Dutch contributions to early modern economic history, from the sixteenth- into the late eighteenth- or nineteenth-centuries.³² Economic historians Jan de Vries and A.M. van der Woude (central figures in this project) point to the period between 1650 and 1680 as the beginning of a secular economic decline. According to them, the combination of stagnating population growth and the strangling of labor-intensive of industries due to price changes meant, “the Republic’s economic Golden Age drew to a close in the course of the 1660s and 1670s.”³³ In recent years, the question of decline has seemed less pressing and many more scholars have produced more tightly defined histories on sectors of the Dutch economy, the role of the labor market, or demographic changes that spoke to larger patterns of decline. Decline seems fractured from this perspective and

³² De Vries and Van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815*; Jonathan Israel, *Dutch Primacy in World Trade, 1585-1740* (New York: Oxford University Press, 1989); Jan Luiten van Zanden, *The Rise and Decline of Holland's Economy: Merchant Capitalism and the Labour Market* (Manchester: Manchester University Press, 1993). Good overviews of the pre-1990s historiography include J.C. Riley, "The Dutch Economy after 1650: Decline or Growth?," *Journal of European Economic History* 13(1984): 521-69. Riley argues against even a relative decline. J.L. van Zanden, "De Economie Van Holland in De Periode 1650-1805: Groei of Achteruitgang? Een Overzicht Van Bronnen, Problemen En Resultaten," *BMGN: Low Countries Historical Review* 102, no. 4 (1987): 562-609. Van Zanden largely agrees with Johan de Vries' assessment of moderate stagnation.

³³ de Vries and van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815*, 676.

responsive to multiple causal variables such as warfare and increased competition for trade and difficulty in attracting foreign workers.³⁴

Few modern narratives of economic decline, however, consider the role of nature-induced disasters and their effects in Dutch cities and the countryside. Disaster events like frosts and floods were short-term extreme events, according to this perspective, and their exceptionality reduced their long-term importance. Writing about the historical impact of climate-related extreme events, for instance, Jan de Vries quipped, “unless these crises can be shown to be something other than unique, exogenous shocks, short-term climatic crises stand in relation to economic history as bank robberies to the history of banking.”³⁵ This (self-described) extreme viewpoint points as much to the importance of acknowledging the relatively advanced condition of Dutch agriculture and market integration during the eighteenth century, as much as it does to a broader tendency in economic history to gloss over nature-induced variables.

Economic historians do not disregard disasters entirely, however. De Vries and Van der Woude note the presence of disasters during the “genuine rural crisis” in agriculture in the Maritime Provinces between 1650 and 1750 and Marjolein ‘t Hart acknowledges that “several disasters added to the general misery” of rural depression in the Netherlands.³⁶ Still, there has yet to be any sustained economic analysis of these disasters as a coordinated and economically

³⁴ Bo Poulsen, *Dutch Herring: An Environmental History, C. 1600-1860* (Amsterdam: Aksant, 2008)., Jelle van Lottum, *Across the North Sea: The Impact of the Dutch Republic on International Labour Migration, C.1550-1850* (Aksant Academic Publishers, 2007), chapter 2.

³⁵ Jan de Vries, "Measuring the Impact of Climate on History: The Search for Appropriate Methodologies," *The Journal of Interdisciplinary History* 10, no. 4 (1980): 599-630.

³⁶ de Vries and van der Woude, *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815.*, 210-211. Marjolein 't Hart, "Town and Country in Teh Netherlands, 1550-1750," in *Town and Country in Europe, 1300-1800*, ed. S. R. Epstein (Cambridge: Cambridge University Press, 2001), 101.

compounding phenomenon, especially outside agricultural history. Floods, cattle plagues, the shipworm epidemic, as well as numerous other nature-induced disasters were costly setbacks, particularly during a “chronic crisis period” lasting from 1730-1750 that cannot be separated from the impacts of shipworms, floods, and cattle plague.³⁷ Not only did these disasters destroy property, but they undermined the labor and tax base necessary to finance repairs to infrastructure or perform regulations. The intense interest among contemporaries regarding the economic consequences of multiple disasters during this era, points to the significance of this approach.

Whether in the context of provincial political economies or simply as expressions of anxiety about decline, contemporaries connected disasters together on economic grounds. To eighteenth-century observers, the stagnant or deteriorating condition of the United Provinces was beyond dispute in the decades following the *rampjaar*. Bernard Costerus, for example, reported that many of his countrymen after 1672 “were reduced to poverty and distress and had lapsed into a wretched state, so that during their remaining years they were not able to repair their ruined livelihoods.”³⁸ The seemingly unending state of war undoubtedly played a large role, but

³⁷ Historians have offered estimates of the economic impact of some catastrophes in the Netherlands using a variety of creative methods, for instance by inferring the cost of disaster based on changing dairy prices (indicating the economic impact of cattle plague). Roessingh, “Landbouw in De Noordelijke Nederlanden, 1650-1815,” 18. This approach neglects the compounding impact of multiple disasters, however. Evaluating the abandonment of land (*spasteking*) may be a promising approach for regions like Holland. Alfons Fransen, *Dijk Onder Spanning : De Ecologische, Politieke En Financiële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864* (Hilversum: Verloren, 2011). 125 morgen of land was abandoned between 1700-1755 in the Holland town of Assendelft. B. Koene, *Goede Luiden En Gemene Onderzaten: Assendelft Vanaf Zijn Ontstaan Tot De Nadagen Van De Gouden Eeuw* (Verloren, 2010), 302. The inability to pay taxes and subsequent abandonment of farms reflected a general failure to adapt to economic circumstances rather than a discrete event. While some local studies evaluate the role of land abandonment in certain regions or periods, no work addresses the issue in broader context.

³⁸ Bernard Costerus, *Historisch Verhaal ... Raakende Het Formeren Van De Republiek Van Holland Ende West-Vriesland* (Leiden: by Coenraad Wishoff, 1736).

even the end of the War of Spanish Succession in 1713 yielded none of the expected return to prosperity. The anonymous author of “Harde Winters,” for instance, noted that although the Treaty of Utrecht had brought the war to a close and the Netherlands ostensibly enjoyed a period of peace, these “twenty seven years” between 1713 and 1740 “was a peace full of turmoil that for many was perhaps worse than open war.”³⁹ Mice infestations of croplands, poor harvests, cattle plague, and intense fluctuation in the price of grain, as well as the widespread flooding of the Rhine in the winter of 1740, prompted the author to note, “I may be permitted to say that nobody has ever lived through such a noted year as this.”⁴⁰

The combined economic weight of multiple disasters, including, but not exclusive to cattle plague, floods, and shipworms was perhaps nowhere better demonstrated than in West Friesland between 1675 and the 1750s. The Second All Saints Day Flood of 1675 affected much of the Zuiderzee region as well as parts of Groningen, but most severely affected West Friesland in North Holland. Salt water submerged the majority of the region for months.⁴¹ In actuality, this was due to two coastal flood events. The first occurred on November 4/5 and caused extensive damage across much of the Zuiderzee region. The second flood on December 4/5 exacerbated the impact of the earlier flood, especially in West Friesland. The severity of the flood was partly a consequence of the long-term history of agriculture in the region. Over the course of the

³⁹ *Een Historiesch Verhaal Van Veele En Nooit Meer Gehoorde Voorvallen Die Geschied Zyn in Verscheide Harde Winters Inzonderheid Van Den Jaare 1709 En 1740: Van Tyd Tot Tyd Aangetekend Door Een Liefhebber En Dus in 't Ligt Gegeeven Met Een Fraaye Kopere Plaat*, (Amsterdam: Arendt van Huyssteen Steeve van Esveldt, 1740), 185.

⁴⁰ *Ibid.*, 184.

⁴¹ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750.*, 32. J. de Bruin and D. Aten, *Een Gemene Dijk?: Verwickelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676* (Purmerend: Vrienden van de Hondsbossche, Kring voor Noord-Hollandse waterstaatsgeschiedenis, 2004), 29.

seventeenth century, Dutch investors and farmers drained, reclaimed, and converted large portions of West Friesland to polder pasturage. The draining of the landscape oxidized the peat soil and the resulting subsidence lowered the level of the landscape. It was no coincidence that the lowest lying section of West Friesland, the *Beschoot* polder, was also the location of the first dike breach. In these ways, flooding (and its economic consequences) revealed a long-term disequilibrium in the relationship between nature and culture in north Holland. Another large reason for the extent and severity of this flood was the economic expense of previous disasters. To the south, near Amsterdam, the Diemer dike was in disrepair due to damage suffered during the *rampjaar* of 1672. This was an important dike because it protected parts of Holland (including the hinterlands of Amsterdam) and parts of Utrecht. Already in January 1673, the Amsterdam city government warned of the “decay” of this dike.⁴² In West Friesland, parts of the sea dike near the town of Hoorn had broken during a previous storm in 1665 and according to contemporaries, was still in disrepair in 1675.⁴³ This flood was remembered less for its death toll (which was minimal) than for its property damage and extent. Over a decade later, in an April 1686 letter sent from various towns in north Holland, representatives expressed their continued inability to pay their taxes because of the flood.⁴⁴

These flood conditions exposed the weaknesses left in the wake of previous disasters and exacerbated the severity of the already declining economic condition of West Friesland.

Population growth had flat-lined since mid-century and agricultural prices stagnated then fell

⁴² Fransen, *Dijk Onder Spanning : De Ecologische, Politieke En Financiële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864*, 146.

⁴³ de Bruin and Aten, *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676*, 31.

⁴⁴ M.K.E. Gottschalk, *Stormvloed En Rivieroverstromingen in Nederland* (Amsterdam: Van Gorcum, 1977)., 279.

during the last quarter of the century, further impoverishing the farmers.⁴⁵ While few people died in the flood, inhabitants lost still cattle and other livestock, their houses, and the entire harvest of 1676.⁴⁶ The West Frisian population, already beset by agricultural recession and the consequences of an ongoing war with France, did not recover until the mid-eighteenth century. Cattle plague between 1713 and 1720 only worsened these conditions. Economic necessity forced hundreds of farmers to abandon their properties after defaulting on their responsibilities for dike upkeep. Land abandonment due to default (*spasteking*) was virtually absent in the region before 1675, but had increased dramatically by the 1730s.⁴⁷

The invasion of shipworms into the same dikes repaired in the aftermath of the Second All Saints Day Flood only exacerbated ongoing difficulties. As estimates for dike repair mounted, local water boards sent several requests to the province of Holland for remission from the taxation required to repair shipworm damage. Some appealed to the economic sense of the provincial administrators, once again calling attention to the high rate of land abandonment. Others noted the importance of West Friesland as a front line for the protection of the rest of Holland against floodwaters. "These sea dikes," one request noted, "are the true citadel of the

⁴⁵ A.M. van der Woude, *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw* (H. Veenman en zonen, 1972), 593-601.

⁴⁶ de Bruin and Aten, *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676*, 29.

⁴⁷ van der Woude, *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw*, 599-600. This was also the case in other areas of Holland affected by the flood including the Diemerdijk area between Amsterdam and Utrecht. H.P. Moelker, "De Diemerdijk: De Gevolgen Van Paalwormvraat in De 18e Eeuw," *Tijdschrift voor Waterstaatsgeschiedenis* 6(1997), 48; Fransen, *Dijk Onder Spanning : De Ecologische, Politieke En Financiële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864*, 393.

entirety of Holland.”⁴⁸ Still others appealed to the province on a more sentimental level. “These same dikes that were maintained despite ruinous costs,” it began, “have up until now been preserved by God’s grace...now the bereaved survivors, namely the impoverished children of the good parents were devoured by the onerous taxes on their own lands...daily these lands are abandoned to the destruction of the community and to the country.”⁴⁹ The ruinous costs of these disasters prevented dike upkeep resulting in an existential threat to this area lying below sea level.

Dikes were not the only site of economic trouble. In the 1740s and 1750s, cattle plague returned with a vengeance. According to a provincial grant to the West Frisian town of Grotebroek in 1754, inhabitants attributed “the principal origins of this decline” to “the lessening value of agricultural products, the ruinous and ongoing cattle plague, [and] the shipworms and their insupportable dike taxes.” Not only could tenant farmers no longer afford to pay their rents, but, “church incomes are no longer enough to pay the ministers, schoolmasters, and other servants and for the maintenance of churches, parsonages, schools, schoolmaster houses and otherwise.”⁵⁰ The consequences of these disasters extended throughout rural society, beyond material into cultural and intellectual life.

⁴⁸ *Memorie Request Van Westvriesland Om Subsidie Om Een Halve Verpondingen*. 1732. Ambacht van Westfriesland genaamd De Vier Noorder Koggen. 1562. 1820. Westfries Archief.

⁴⁹ *Beschryvinge, Van De Schade En Raseringe Aan De Zee-Dyken Van Noort-Hollanden West-Vriesland, Door De Worm in De Palen, En De Daar Op Gevolgde Storm, En Vervolgens: Waar by Komt Een Beschryving Van Een Nieuwe Water-Machine*, vol. 16849A (Hoorn: Jacob Duyn, 1732), 18.

⁵⁰ *Akte Waarbij De Staten Van Holland En West-Friesland De Stede Grootebroek T.B.V. Haar Kerken, Armen En Weeshuis Kwijtschelding Verlenen Van Achterstallige Verponding*. 3 Oct 1754. Stede en gemeente Grootebroek 1364-1949. 1107. 281. Westfries Archief.

The period between 1672 and 1764, therefore, offered a challenging set of economic circumstances to the province of Holland, West Frisian landowners, and the local water boards. Taxation policies suitable during times of plenty were no longer tenable by the mid-eighteenth century. This was also not the first time, nor the last, that the West Frisian jurisdictions required remission from taxes. West Frisians abandoned so much land that the city of Alkmaar, which assumed responsibility for these properties, became the largest landowner in the region. In 1745, following the cold winter and poor harvest of 1740/41 and the mouse infestations of croplands in 1742, a group of municipal administrators complained of the increasing burden of taxation. “Give us redress from taxation,” they requested, “to prevent a total abandonment.”⁵¹ Had Romein de Hooghe printed his *Ellende Klacht* in 1745, it could well have included cattle plague, abandoned fields, frosts, mice, and shipworms. Each of these disasters exacerbated the costs of the previous disaster and contributed to Dutch decline.

Sensibility to Long-term Environmental Change

Long-term environmental changes also defined this period of disaster in the Netherlands. As the example of subsidence of peat soils in Holland suggests, many contemporaries understood that the catastrophes of the eighteenth century came about as part of a longer history of landscape change caused by natural and human processes. Disasters in the present were consequences of these transformations. Contemporaries did not restrict these changes to the period between 1672 and 1765. Unlike economic or moral considerations, disaster literature did not address the “environment” as a distinct category in their dialogues of decline. Nevertheless, the post Golden Age period of disaster altered the Dutch ability to manipulate their environment in a manner

⁵¹ Johannes Jouke Schilstra, *In De Ban Van De Dijk: De Westfriesse Omringdijk* (Hoorn: West-Friesland, 1982), 92.

common during times of prosperity. Disaster also catalyzed increasingly systematized evaluations of long-term environmental change.

The environment was a subject of considerable interest to the eighteenth-century Dutch, albeit an interest inseparable from human history, social context, and a providential understanding of God's role in maintaining and changing nature. Eighteenth-century historical accounts of cities and provinces, chronicles, almanacs, and many other narrative accounts of Dutch history preserved and elaborated on these relationships. Disasters were the most dramatic instances of change and therefore accounted for a large degree of interest in short-term changes in the environment. Some commentators, however, sought broader understandings of environmental perturbation that integrated histories of disasters into evaluations of geography and their own vulnerability. Frisian historian Simon Gabbema's history of Dutch floods, for instance, began by arguing, "No land is more often and more disastrously flooded through the centuries than the Netherlands."⁵² The resulting summaries of historic floods certainly supported providentialist argumentations, but they also generated awareness of long-term environmental changes and vulnerabilities resulting from human agency.

Disasters also instigated large-scale ecological changes that often prompted optimistic, technocratic responses. Many of these disasters were centuries old. The disastrous St. Elizabeth's flood of 1421, for instance, wiped out entire villages in Zeeland and southern Holland and flooded the whole landscape surrounding the city of Dordrecht, converting it into an island. The enduring power of this memory was evident even two and a half centuries later when the English

⁵² Gabbema, *Nederlandse Watervloeden, of Naukeurige Beschrijvinge Van Alle Watervloeden Voorgevallen in Holland ... En De Naabuirige Landen*, 7.

diplomat and art historian William Aglionby described Dordrecht in his guidebook. “In the year 1421,” he reported, “the banks broke near Dort [Dordrecht], and about threescore and ten fair villages were swallowed up by the unmercifull element of water, and above 100,000 men died miserably with their wives and children.” Although this number was wildly exaggerated (likely around 2,000 died), its effect on the landscape was profound and enduring.⁵³ The significance of this disaster extended to 1671 when Aglionby published his account. “Since the water, having by little and little been driven away by the industry of the infatigable inhabitants,” he proclaimed, “they have drained most part of that which lay under water, and discovered some villages.” The landscape Aglionby encountered was an enduring testament to the power of this disaster and the resulting attempts to refashion the landscape in its aftermath. Aglionby’s confidence that Dordrecht would complete the reclamation soon, “getting all, during this peace,” reflected the Golden Age optimism of his hosts.⁵⁴

Golden Age authors tended to privilege human agency as a force of environmental transformation. These narratives were virtually inescapable in the Netherlands, particularly in the realm of water management. The Golden Age had been an era of dramatically increasing land reclamation, especially in Holland with its large system of peat lakes. Ironically, these lakes were themselves products of anthropogenic transformation, including reclamation, which began in the Medieval Era. Inhabitants drained the raised peat bogs as early as 800 AD in the southern

⁵³ Karel Leenders, “‘Die Inundatie Ende Inbreck Van Onsen Grooten Waert’: De Verdrinking Van De Grote Waard,” in *‘Nijet Dan Water Ende Wolcken’: De Onderzoekscommissie Naar De Aanwassen in De Verdrongen Waard (1521-1523)*, ed. Valentine Wikaart (Tilburg: Stichting Zuidelijk Historisch Contact, 2009).

⁵⁴ William Aglionby, *The Present State of the United Provinces of the Low-Countries: As to the Government, Laws, Forces, Riches, Manners, Customes [!], Revenue, and Territory, of the Dutch. In Three Books* (London: Printed for J. Starkey, 1671), 290.

Rijnland region of Holland for arable production.⁵⁵ The resulting subsidence due to peat oxidation had the unintended consequence of lowering the surface level by as much as one meter per year. Peat excavation exacerbated these conditions, which by the late medieval period, produced a series of large and expanding lakes in North and South Holland.⁵⁶ Golden Age land reclamation schemes attempted to reverse these centuries-old ecological changes using capital-intensive, technological solutions.⁵⁷

The deteriorating economic conditions of the period of disaster dampened this optimism and limited Dutch efforts to reclaim lands lost to disaster. In the case of Dordrecht, the “peace” that Aglionby felt confident would promote final reclamation of the flooded region near Dordrecht, catastrophically ended the following year in 1672. Thirty years later, an anonymous English guidebook noted many of the same details of the flood, but included no optimistic presumption of future reclamation.⁵⁸ Similarly, a large coastal flood in 1509 inundated a region called the Riederland on the border region between Groningen and what is now Niedersachsen. This flood created a new set of enduring ecological and social relationships between Groningers and their landscape.⁵⁹ During the capital rich sixteenth- and seventeenth centuries, Groningers

⁵⁵ William H. TeBrake, *Medieval Frontier : Culture and Ecology in Rijnland* (College Station: College Station : Texas A&M University Press, 1985).

⁵⁶ P.J.E.M. van Dam, "Sinking Peat Bogs: Environmental Change in Holland, 1350-1550," *Environmental History* 6, no. 1 (2001): 32-45.

⁵⁷ Siger Zeischka, *Minerva in De Polder: Waterstaat En Techniek in Het Hoogheemraadschap Van Rijnland 1500-1865* (Hilversum: Uitgeverij Verloren, 2008).

⁵⁸ *A New Description of Holland, and the Rest of the United Provinces in General: Containing Their Government, Laws, Religion, Policy, and Strength; Their Customs, Manners, and Riches; Their Trade to the Indies, and Their Fishery and Bank, with a Particular Account of Amsterdam, Hague, Rotterdam, and the Other Principal Cities, of Holland* (London: H. Rhodes, 1701), 29.

⁵⁹ Karel Essink, *Stormvloed 1509: Geschiedenis Van De Dollard* (Stichting Verdrongen Geschiedenis, 2013). In 2009, a collection of Dutch and German scholars held a symposium on the history of this transformative disaster. Their collection of essays are available at <http://www.verdrongengeschiedenis.nl/nl/>

reclaimed significant portions of the Oldambt region (part of the former Reiderland) that was flooded in 1509. Just as elsewhere, however, the pace of reclamation slowed dramatically during the period of disaster. Only six of the thirty-one reclamation projects undertaken after the 1509 flood occurred between 1672 and 1764.⁶⁰ This trend mirrored larger patterns of the reduced economic ability to reclaim land. The nadir of Dutch land reclamation occurred precisely during the period of disaster, with the lowest amount occurring between 1740 and 1764. This declining trend in land reclamation was both an economic indicator of reduced capital investment in agriculture, as well as remarkable signal of the declining optimism of environmental control characteristic of this era.

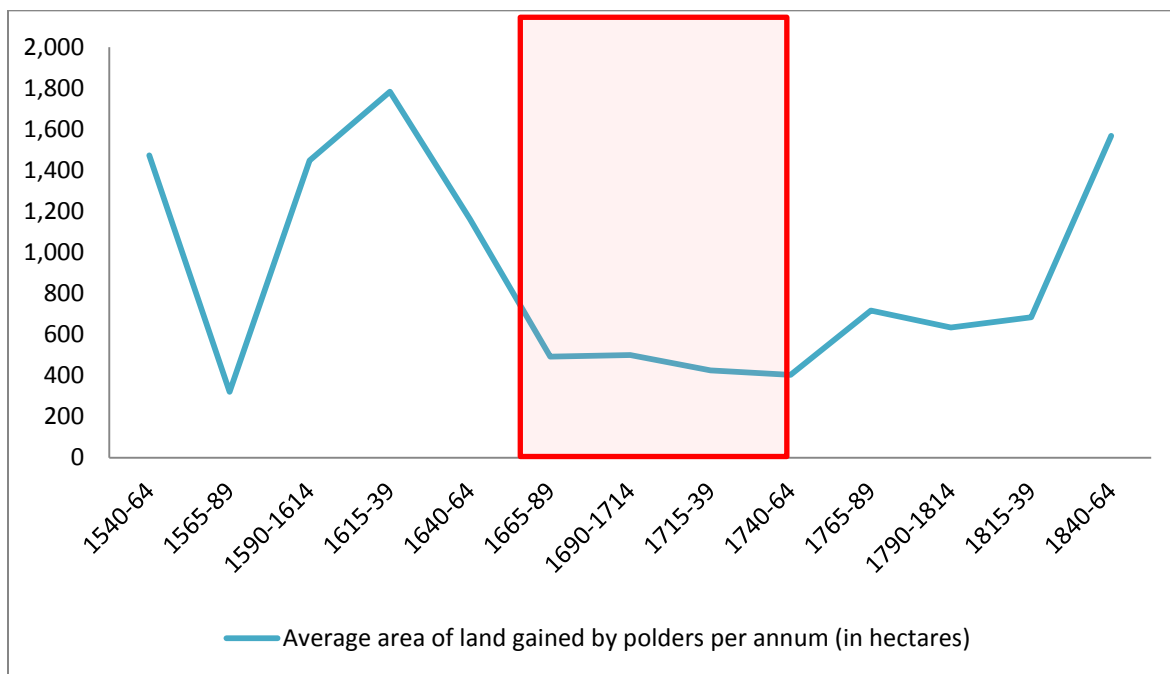


Figure 6.3. Area of Land Gained in the Netherlands by Polders per annum. The red box highlights the period of disaster between 1672 and 1764. One of the most visible consequences of economic depression coupling with disasters was the sharp decline in reclamation projects that closely corresponded to the period of disaster. Source: Bernard H. Slicher van Bath, "Agriculture in the vital revolution." *The Cambridge economic history of Europe 5* (1977), 70.

⁶⁰ O. Kottnerus & G. Blijham, *Het Oldambt, dl. 2, Het Landschap* (Bedum: Profiel), 2000.

Reclamation potential during the period of disaster was also sometimes responsive to other nature-induced disasters and environmental changes. Flooding, climate change, and disease may also have contributed. Reclamation fostered the percolation of brackish groundwater and stagnant floodwaters provided ideal habitats for malaria-carrying mosquitos. Eighteenth-century malaria outbreaks appear to have also coincided with warmer summers and storms surges.⁶¹ In the Oldambt region, the period of highest death rates due to malaria occurred between 1673 and 1795, with peaks the hot and dry summers of the 1720s and 1730s.⁶² These conditions combined with the cumulative toll of cattle plague and repeated flooding to reduce the feasibility of reclamation projects.⁶³ The confluence of previous disasters and warmer weather, in other words, conditioned ecological challenges that further dampened Golden Age reclamation ambitions.

Eighteenth-century Dutch observers also sometimes connected disease to environmental changes, especially flooding. Neo-Hippocratic environmental medicine connected epizootics to changes in the atmosphere or to disasters like floods, earthquakes, and comets.⁶⁴ Hendrik Carel van Byler, for instance, argued in his “Historic Account of the Deaths of Cattle in Previous Centuries” (*Historis-Verhaal van de Sterfte die in vorige Eeuwen onder Rundvee*) that climatic and landscape changes had affected the occurrence and distribution of cattle plague in the past. Van Byler noted that the 1115 cattle plague in England, for instance, was derivative of a winter

⁶¹ Henk Brouwer, "Malaria in Nederland in De Acttiende En Negentiende Eeuw," *Tijdschrift voor Sociale Geschiedenis* 9(1983), 143.

⁶² Otto S. Knottnerus, "Malaria around the North Sea: A Survey," in *Climatic Development and History of the North Atlantic Realm: Hanse Conference Report*, ed. Gerold Wefer, et al. (Berlin: Springer-Verlag, 2002). For death rates, see table 1.

⁶³ Daniel R. Curtis, *Coping with Crisis: The Resilience and Vulnerability of Pre-Industrial Settlements* (Burlington, VT: Ashgate Publishing Limited, 2014), 189. Curtis considers this a temporary setback for an exceptionally resilient population which would begin to see dramatic land consolidation and growth in the period following 1735.

⁶⁴ J.F. Smithcors, *Evolution of the Veterinary Art: A Narrative Account to 1850* (Kansas City, MO: Veterinary Medicine Publishing Co., 1957), 117.

that “was so fierce and sharp that nobody then living could remember a worse one” and that a flood in 1248 produced a cattle plague that was transferred to people due to the harsh heat of the summer. According to Van Byler, flooding polluted fresh water—a circumstance that caused illness on numerous occasions throughout the sixteenth century.⁶⁵ Other commentators linked plague to atmospheric variability. Jan Marchant argued in his “Echo of the Cattle Plague” (*Naagalm over de Veeziekte*) that abrupt atmospheric changes, from hot to cold, from wet to dry, produced disease. Marchant also related the plague to other disasters, particularly floods that dampened the environment. “The places lying under the sea winds,” according to Marchant, were “the most vulnerable.”⁶⁶ Marchant did not relate the disease to human factors; rather he connected them to what he perceived to be an unhealthy, variable climate during the 1740s.

Dutch observers also found clear connections between Golden Age environmental changes, increasing vulnerability to flooding, and the shipworm threat. Many of these connections had deep roots, but their consequences crystallized during the disaster period. One important concern during the eighteenth century was the changing influx of water into the Zuiderzee. Ships traveling from the North Sea into the Zuiderzee passed between dense and slowly shifting sand banks. The Marsdiep was one of the deepest and safest channels to enter the Zuiderzee and thus gain access to fishing ports like Enkhuizen and cities like Amsterdam.⁶⁷ It was situated between the northern tip of Holland (*Kop van Holland*) and the southern tip of the

⁶⁵ Van Byler, *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. (Groningen: Jurjen Spandaw, 1719), 53-56.

⁶⁶ Jan Marchant, *Naagalm over De Vee-Ziekte, Met Een Jaarlijst Der Voorgaande Vee-Sterftes, Sédert De Plagen Van Egipten: Alsmede De Waare Oorzaak Der Koeje-Ziekte, En De Middelen Om Die Voor Te Koomen* (Haarlem: J. Marshoorn en Iz. vander Vinne, 1745), 18.

⁶⁷ The only other safe channel for large ships was the “Vlie” between the barrier islands of Vlieland and Terschelling.

barrier island Texel. Over the course of the seventeenth century, the Dutch recognized that the Marsdiep was broadening and deepening, and its flow was increasing, raising the level of tides and increasing erosion along the coasts of the Zuiderzee.⁶⁸ Because it was such an important route for fishing and trade, the Marsdiep was also one of the most closely studied and mapped coastal areas in the Netherlands. Dutch cartographers mapped the changing position of these access channels in the Marsdiep, which provide snapshots that clearly illustrate this important environmental change.

Willem Jansz. Blaeu's map of the Marsdiep published in his "Mirror of the Sea" (*Zeespiegel*) at the height of Golden Age prosperity clearly shows three access channels, the Slenck, the Landsdiep, and the Spanjaardsgat. (Figure 6.4) At the beginning of the sixteenth century, the Spanjaardsgat was the primary channel through the Marsdiep. This situation slowly changed as the continual ebb and flow reduced its depth and pushed the channel closer to the island of Texel. By 1623, the Spanjaardsgat was still the primary trade channel, but other channels like Landsdiep equaled it in depth. By 1680, this situation had drastically changed. (Figure 6.5) Joan Blaeu's map of the Marsdiep shows the Spanjaardsgat now abutting the Island of Texel. The shallowest part of the channel is only 16 feet deep and would completely close within ten to fifteen years.⁶⁹ At the same time, the Slenck had broadened and deepened and, by the end of the Golden Age, the Marsdiep allowed an increasing amount of water into the Zuiderzee.

⁶⁸ Piet Boon, "Voorland En Inlagen: De Westfriese Strijd Tegen Het Buitenwater," *West-Frieslands Oud en Nieuw* 58(1991), 80-81.

⁶⁹ E. Walsmit, *Spiegel Van De Zuiderzee: Geschiedenis En Cartobibliografie Van De Zuiderzee En Het Hollands Waddengebied* (HES & De Graaf, 2009), 33.

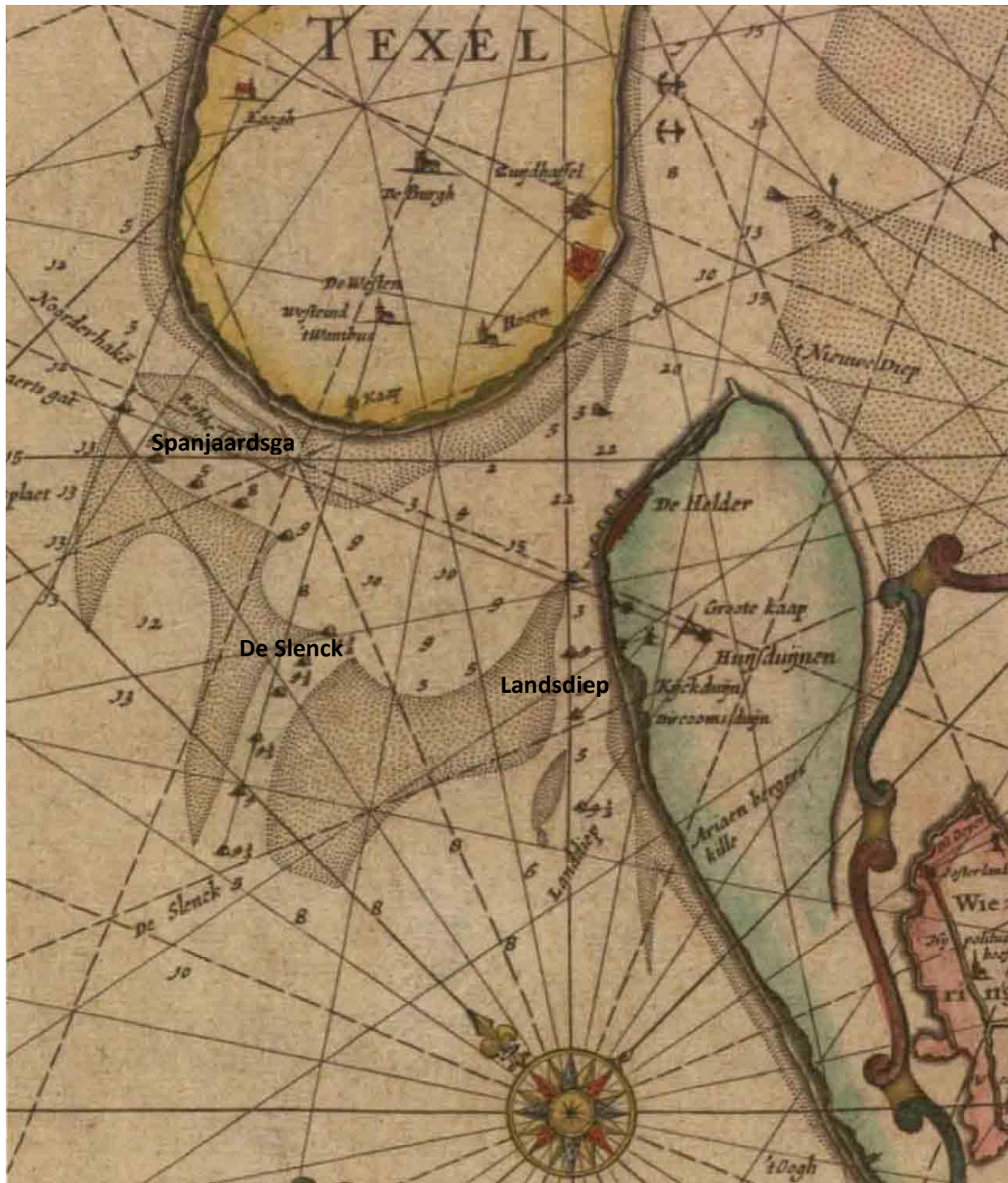


Figure 6.4 Detail of the Marsdiep from *Zeespiegel* Willem Jansz. Blaeu, 1623. Blaeu's map highlights the location of sand banks, three primary access channels, and the depth of the Marsdiep at the height of the Golden Age. From E. Walsmit, *Spiegel Van De Zuiderzee: Geschiedenis En Cartobibliografie Van De Zuiderzee En Het Hollands Waddengebied* (HES & De Graaf, 2009), 32.

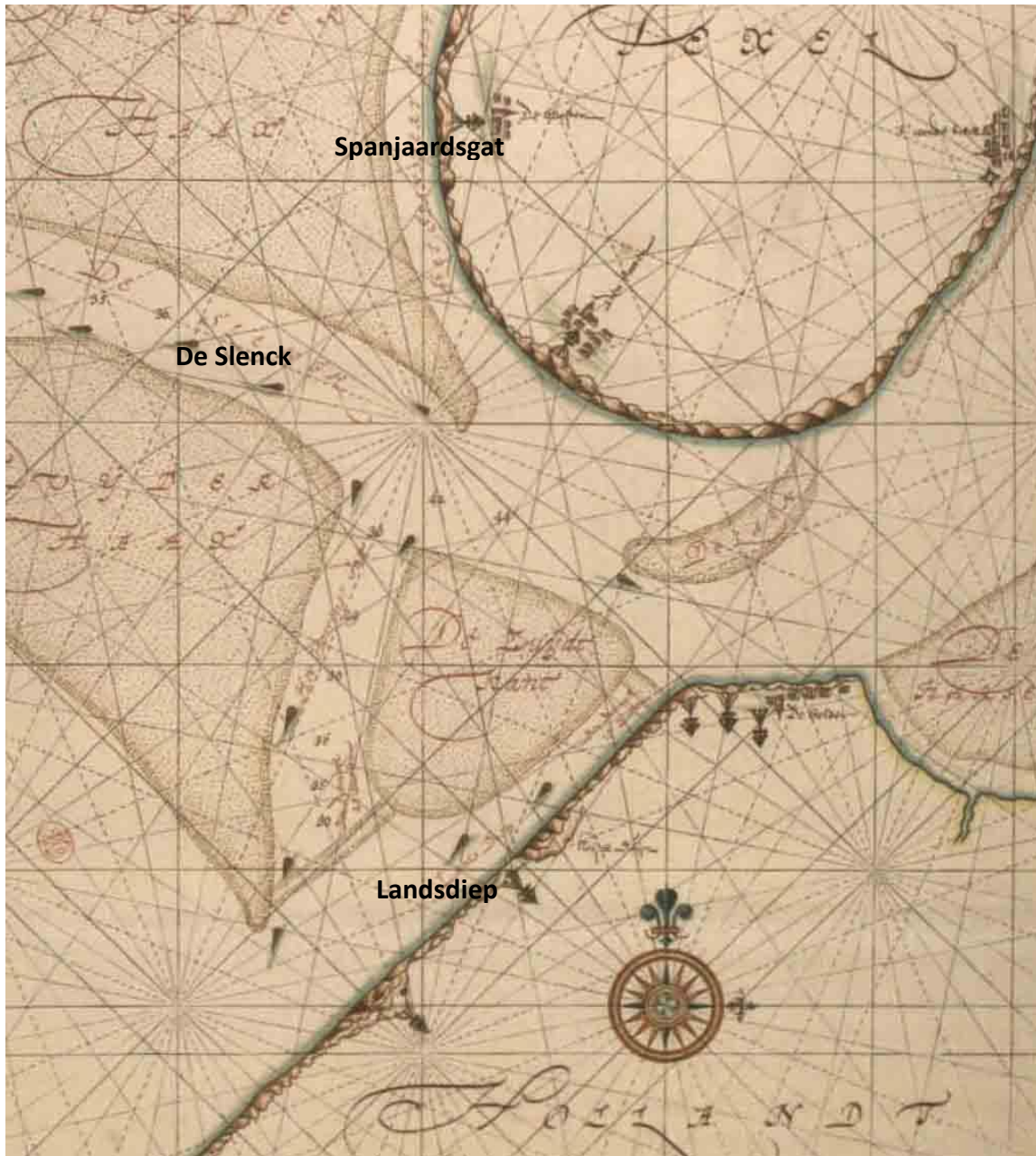


Figure 6.5 Detail of the Marsdiep, Joan Blaeu II, 1680. Hand drawn map. This later map shows the shifting sandbanks and the gradually deepening Marsdiep that became increasingly problematic during the period of disaster.⁷⁰ Contemporaries attributed the increasing tidal erosion of the Zuiderzee to the greater amount of water passing through the Marsdiep. E. Walsmit, *Spiegel Van De Zuiderzee: Geschiedenis En Cartobibliografie Van De Zuiderzee En Het Hollands Waddengebied* (HES & De Graaf, 2009), 33.

⁷⁰ Figure 6.4 and 6.5 can be found in *ibid*, 32-33.

This problem of a deepening *Marsdiep* was derivative of profound geomorphological changes that began to receive institutional attention by the late seventeenth century.⁷¹ In March of 1688, for instance, the *Staten van Holland*, ordered the investigation of “the constitution of inlets and beaches that stream through the channels of this Quarter in the *Zuiderzee*.” Unfortunately, little initially came of the report.⁷² Amsterdam *burgemeester* Johan Hudde van Waveren again broached the subject in 1694 because he and others in the city government believed that the increasing influx was partly responsible for the floods of 1675.⁷³ The growing water volume accelerated coastal erosion and washed away the land in front of dikes that previously served to break the force of the waves. At the same time, the subsidence of peat soils exacerbated vulnerabilities as the landscape slipped further and further below sea level.⁷⁴ These developments had direct consequences for flood management, drainage, and agriculture, and indirect implications for the shipworm episode. Wooden construction such as breakwaters and *paal* or *wierdijken* protected these increasingly exposed and vulnerable dikes, but simultaneously conditioned the explosion of shipworms.

These long-term changes provoked as much consternation at times as the shipworms themselves. During an inspection of the West Frisian dikes in 1732, for instance, a special commission noted in their memorandum on the “current situation of the West Frisian dikes,” that “I can little see how this entire quarter [of West Friesland] will ever again be land due to the

⁷¹ Dutch cartographers visualized these changes. *Ibid.*, 31-33.

⁷² Guus J. Borger, Philippus Breuker, and Hylkje de Jong, *Van Groningen Tot Zeeland: Geschiedenis Van Het Cultuurhistorisch Onderzoek Naar Het Kustlandschap* (Hilversum: Verloren, 2010), 91.

⁷³ Walsmit, *Spiegel Van De Zuiderzee: Geschiedenis En Cartobibliografie Van De Zuiderzee En Het Hollands Waddengebied*, 23.

⁷⁴ Boon, “Voorland En Inlagen: De Westfrieze Strijd Tegen Het Buitenwater,” 85.

violence that the sea through the nearness of the Marsdiep and the depth of the water in front of the dikes.”⁷⁵ Although these long-term environmental changes were not disasters, they nonetheless played an important role in the shipworm epidemic, even going so far as to dampen the typically optimistic perspective of engineers.

The shipworm epidemic also prompted the first natural historical investigation of Holland. West Frisian Zacharias L’Epie’s “Investigation into the historic and ongoing natural condition of Holland and West-Friesland” evaluated the connections between long term, slowly developing environmental vulnerability and disaster.⁷⁶ At its heart, L’Epie’s work was a landscape history that traced slow changes in the relationship between land and water, in particular the “accretion, elevation, subsidence, and sinking” of land as it related to dike building. L’Epie contended that drainage caused the landscape to sink relative to sea level. This was problematic for a number of reasons, not the least of which was storm surges. “Nobody should imagine,” L’Epie stated, “that the reported subsidence and sinking of these lands, is a matter of little importance, or that a close examination and careful consideration is unworthy.”⁷⁷ This examination of landscape history was a necessary prelude to the main topic of his discourse, the biology of shipworms and his proposed solution to the epidemic.

⁷⁵ *Memorie Wegens Den Toestandt Van Den Westfriessen Zeedijck*. 1732. Gedeputeerden van Haarlem ter Dagvaart. 3.01.09. 1237. Nationaal Archief (NA) 3.01.09 1237, 17.

⁷⁶ Zacharias L’Epie, *Onderzoek over De Oude En Tegenwoordige Natuurlyke Gesteldheyd Van Holland En West-Friesland, Desselfs Rivieren En Landen, Aanwas, Ophooping, Zakking, Laagte En Dykagie ... : Mitsg. Eene Verhandeling over De Zee- of Kokerwormen: Als Mede De Middelen Tot Versterking Der Zee-Weeringen* (J. Hayman, 1753).

⁷⁷ *Ibid.*, 68.

Indeed, L'Epie was at the forefront of an increasingly systematized understanding of the Dutch relationship between the environment, technology, and disaster. Hydraulic engineering in particular continued to develop (and prosper) in the context of this era of disaster. Well-known Dutch engineer Nicolaas Cruquius and surveyor Cornelis Velsen's maps and treatises on river control in the south of Holland, for instance, came shortly after the devastating floods of 1726 and 1740/41.⁷⁸ Velsen in particular framed his treatise on hydraulic engineering in the context of disaster, historical vulnerability, and preserving Dutch prosperity. "It is hard for anyone who is not learned to believe how much the welfare of a country and a people depend on its rivers," Velsen argued, but "indeed, I would go so far as to say, that one may not live safely in a country where the rivers are not properly managed."⁷⁹ Following the river floods of 1744, Velsen had published a shorter work explaining fluvial dynamics and in doing so, offered a list of previous floods back to the sixteenth century.⁸⁰ History (particularly riverscape history) also played an important role in his 1749 treatise and almost one-third of the work chronicles changes to the river over time.

⁷⁸ P. van den Brink, *"In Een Opslag Van Het Oog": De Hollandse Rivierkartografie En Waterstaatszorg in Opkomst, 1725-1754* (Alphen aan den Rijn: Canaletto/Repro-Holland, 1998). The river floods of 1726 and 1729 prompted Nicolaas Cruquius' famous map of the Merwede River. It was also the first map to show bathymetric depths contours. Velsen's work was inspired by the floods in 1740/41. Both men also played critical roles in the shipworm epidemic. Velsen and Cruquius served as advisors, vetting proposals to combat shipworms. Karel Davids, *The Rise and Decline of Dutch Technological Leadership, Volume 2: Technology, Economy and Culture in the Netherlands, 1350-1800*, vol. 2 (Leiden: Brill, 2008), 508.

⁷⁹ Cornelis Velsen, *Rivierkundige Verhandeling, Afgeleid Uit Waterwigt En Waterbeweegkundige Grondbeginselen, En Toepasselyk Gemaakt Op De Rivieren Den Rhyn, De Maas, De Waal, De Merwede En De Lek* (Amsterdam: Is. Tirion, 1749), preface, 2.

⁸⁰ *Aanmerkingen Van Cornelis Velsen Geadmitteert Landmeeter, Op De Zeerlangduurige En Naauwkeurige Observatien, Omtrent De Rivieren De Wael, Maas, Merwede En Leck Tot Aan Zee Gedaan; Aantoonende Hoe Sig Die Verdorven Hebben, Als Mede Het Gevaar Waar in De Provincien, Gelderland, Holland, Utrecht En Overysse, Sig Bevinden, Indien 'Er Geen Spoedige Hulpmiddelen Werden Aangewent, Waar Van De Eenigste Die Te Vinden Zyn, Werden Vertoont &Cc. Door Justus Van Den Burchgraaf* (Leiden: By Daniel Goetval, 1744).

Furthermore, in contrast to the views of early political economists who downplayed the geographical elements of Dutch prosperity, Velsen painted a picture where Dutch peace, commerce, and culture each depended on proper management of rivers and protection against disaster.

“What advantage does a people, or nobility, or government gain by protecting itself against the assaults of foreign enemies; or to prosper in commerce; or to nurture the arts and sciences; or to bring the finances of the country into a good state; or to relieve taxes; or to preserve the common peace and ensure the happiness and prosperity if the inhabitants must in the meantime remain subject sooner or later to flooding from their rivers and thus lose unexpectedly, suddenly, and forever their most wished for things (for some their lives)?”⁸¹

The elements of Dutch prosperity that Velsen underlined were not coincidentally the same subjects that generated the greatest anxiety about Golden Age decline. Published in 1749 following the nadir of the period of disaster, this passage referenced ongoing attempts at financial reform, a threatened French invasion, and tax-related local uprisings.⁸² It also followed in the wake of the disastrous floods of 1740/41 and renewed flooding in 1744 and 1747.⁸³ Nature-induced disaster threatened to undermine any attempts to improve Dutch prosperity during this period. Velsen, Cruquius, L’Epie and other engineers and natural historians of the

⁸¹ *Rivierkundige Verhandeling, Afgeleid Uit Waterwigt En Waterbeweegkundige Grondbeginselen, En Toepasselyk Gemaakt Op De Rivieren Den Rhyn, De Maas, De Waal, De Merwede En De Lek.*

⁸² See Appendix II.

⁸³ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750, 747-751; 776-780.*

early eighteenth century offered a newly systematized and largely technocratic response to the changing environmental conditions of this era of decline.

A Climate of Disaster

Disaster and decline defined the era between 1672 and 1764. Contemporaries already conceptually unified disasters on a number of cultural, economic, and environmental levels. Unbeknownst to them, this era also occurred during a distinct moment of transition in climatic history. The late seventeenth century signaled the end of the global Little Ice Age.⁸⁴ In the Netherlands, the transition began with extreme cold in the 1670s, followed by an unusual warm period lasting through the mid-eighteenth century. Temperature was only part of the picture, however. Climate variability, more than any general trend favoring hot or cold weather, challenged Dutch resilience. The clustering of devastating nature-induced disasters during this period was indicative of a new climate regime favoring extreme events that worked in conjuncture with economic, social, and cultural factors to produce a synergy of disaster.⁸⁵

Historians have an established history of integrating climate into long standing historiographical debates in political and economic history. The most famous example is the “Crisis of the Seventeenth-Century” debate, which has been ongoing since Eric Hobsbawm’s

⁸⁴ Scholars have until recently described the global Little Ice Age as lasting from the end of the Medieval Warm Period in the early fourteenth-century to the mid-nineteenth-century. Sam White, “The Real Little Ice Age,” *Journal of Interdisciplinary History* 44, no. 3 (2014): 327-52. Recent global temperature reconstructions show a remarkable synchronicity between northern and southern hemispheres during only one extended cold period that lasted from 1594 to 1677 (almost perfectly coinciding with the Dutch Golden Age). Raphael Neukom et al., “Inter-Hemispheric Temperature Variability over the Past Millennium,” *Nature Clim. Change* 4, no. 5 (2014): 362-67.

⁸⁵ Sherry Johnson refers to these moments of transition as “pivot phases” in her contribution to the recent Climate Change and Environmental History forum in *Environmental History*. Sherry Johnson, “When Good Climates Go Bad: Pivot Phases, Extreme Events, and the Opportunities for Climate History,” *Environmental History* 19, no. April (2014): 329-34.

pioneering article in 1955 that defined the political crisis in economic terms and was later broadened into a more “general crisis” by Hugh-Trevor Roper and Thomas Rabb.⁸⁶ Recently, historian Geoffrey Parker not only expanded the crisis narrative from a European to a global context, but he argued that Little Ice Age climate coupled with human factors (in particular, military organization and state structure) to create a “fatal synergy” that resulted in global crisis between the 1610s and 1690s. This “global crisis” resulted in widespread political failure, mortality, and dislocation.⁸⁷ Interestingly, the Netherlands weathered this crisis period effectively, and in fact attained the fullest expression of their Golden Age success amidst some of the most adverse conditions of the Little Ice Age.⁸⁸ Parker’s *Global Crisis: War, Climate Change & Catastrophe in the Seventeenth Century* was not only the “fullest statement of the seventeenth-century crisis conception to date,” it was also one of the most comprehensive statements of Little Ice Age adversity as it related to the cold.⁸⁹

⁸⁶ Eric Hobsbawm, “The General Crisis of the European Economy in the 17th Century,” *Past & Present* 5(1954): 33-53; Hugh R Trevor-Roper, “The General Crisis of the 17th Century,” *Past and Present* (1959): 31-64. Theodor K. Rabb, *The Struggle for Stability in Early Modern Europe* (Oxford: Oxford University Press, 1975). Jan de Vries, “The Economic Crisis of the Seventeenth Century after Fifty Years,” *Journal of Interdisciplinary History* 40, no. 2 (2009): 151-94. One exception to the lull in Crisis literature was the edited volume Philip Benedict and Myron P. Gutmann, *Early Modern Europe: From Crisis to Stability* (Newark: University of Delaware Press, 2005).

⁸⁷ Geoffrey Parker, *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century* (New Haven: Yale University Press, 2013). Parker’s global treatment of the seventeenth century crisis was foreshadowed by an active debate about the role of population and agrarian chance and silver bullion. See: Jack A. Goldstone, “East and West in the Seventeenth Century: Political Crises in Stuart England, Ottoman Turkey, and Ming China,” *Comparative Studies in Society and History* 30, no. 1 (1988): 103-42; Andre Gunder Frank, *Reorient: Global Economy in the Asian Age* (Berkeley: University of California Press, 1998).

⁸⁸ Parker does not attempt to explain this exceptionality and Dagomar Degroot maintains that climate offered both challenges and opportunities to the Dutch during this era. Degroot, “The Frigid Golden Age: Experiencing Climate Change in the Dutch Republic, 1560-1720.”

⁸⁹ Jan de Vries, “The Crisis of the Seventeenth Century: The Little Ice Age and the Mystery of the “Great Divergence,”” *Journal of Interdisciplinary History* 44, no. 3 (2014), 370. Parker also integrates his discussion with a second major historiographical debate, that of the “Great Divergence” between Western Europe and Asia over the course of the early modern period. Parker ties the Little Ice Age traumas to the lessening of confessional conflicts,

Global Crisis along with much of the historical climate scholarship on early modern Europe focuses on periods that experienced temperature nadirs. Extreme winters, or unseasonably cold and wet springs and summers are most frequently connected to societal struggle. This is no doubt partly the result of the limitations of the documentary record. In the Low Countries, for instance, witnesses were more likely to record climatic phenomena that had a direct impact on their daily lives. Cold and wet weather threatened agriculture, sea ice blocked ports and hindered commerce, and frosts and heavy snowfall prompted painters, poets, and moralists to imprint dramatic cultural impressions of winter in European culture.⁹⁰ With the exception of drought periods, winters received far more documentary attention than summers.⁹¹ While the average winter temperature certainly declined during the Little Ice Age, milder winters and hot summers also occupied an important role, particularly in the context of climatic variability. Decades long cold snaps followed relatively benign conditions; periods of increased storminess followed periods of calm; and the regime of rainy autumns, cold springs, and rainy harvest weather that produced “Little Ice Age-type Impacts” might quickly follow drought.⁹² Increasingly, the extraordinary variability of the early modern weather has come to dominate

freeing Europe to manage its economic affairs. De Vries maintains his skepticism about the role of climate in long-term societal and economic change.

⁹⁰ Gerhard Koslowski and Rüdiger Glaser, "Variations in Reconstructed Ice Winter Severity in the Western Baltic from 1501 to 1995, and Their Implications for the North Atlantic Oscillation," *Climatic Change* 41, no. 2 (1999): 175-91. Wolfgang Behringer, *A Cultural History of Climate* (Cambridge: Cambridge : Polity, 2010). For an overview of Low Countries historical climatology, see: Adriaan M. J. De Kraker, "Historical Climatology, 1950-2006" *Belgeo* 3(2006): 307-38.

⁹¹ A. F. V. van Engelen, J. Buisman, and F. Ijnsen, "A Millennium of Weather, Winds and Water in the Low Countries," in *History and Climate*, ed. P. D. Jones, et al. (Springer US, 2001), 7.

⁹² Christian Pfister and Rudolf Brázdil, "Social Vulnerability to Climate in the "Little Ice Age": An Example from Central Europe in the Early 1770s," *Climate of the Past* 2, no. 2 (2006): 115. Pfister and Brázdil conceive of “Little Ice Age-type Impacts” (LIATIMP) as a specific set of precipitation and temperature combinations that adversely impacts agriculture in western and central Europe; conditions which prompted increased vulnerability in pre-modern societies. This combination certainly had detrimental effects in the Netherlands as well, though for the early to mid-eighteenth-century, a different set of LIATIMP might have been possible.

scholarship about its societal impacts, particularly as climatologists and historians have tested the connections between dramatically shifting temperatures and external climate variables.⁹³

Climatic variability characterized the post Golden Age period of disaster. It straddled two dominant regimes of temperature in the Netherlands as identified by historical climatologists. The period stretching between 1672 to around 1700 was a large part of a phase of colder weather beginning in the 1660. Average winter temperatures during this period reached their lowest points in the last 1,000 years. This period featured five very strong winters between 1691 and 1700 alone. Major flooding was rare, though the coastal floods of 1675, 1682, and 1686 were notable exceptions. The 1670s initiated several decades of extreme variability in weather, with warm summers accompanied by cold winters.⁹⁴ Climate morphed into a different regime around the turn of the century – one predominated by milder temperatures in comparison to the previous era, though with strongly variable springs and autumns. This regime was also marked by several distinctly cold winters and long periods of drought.⁹⁵ Colder temperatures returned in the 1750s. Decadal variability and extreme events, more than any other factors, characterized the period between 1672 and around 1764.

⁹³ In addition to thermohaline circulation, volcanism, and human mortality, the lack of sunspot activity (and resulting dips in solar radiation) have consistently attracted scholarly attention as possible causes or contributors to the Little Ice Age. Alan D. Wanamaker et al., "Surface Changes in the North Atlantic Meridional Overturning Circulation During the Last Millennium," *Nat Commun* 3(2012): 899. Gifford H. Miller et al., "Abrupt Onset of the Little Ice Age Triggered by Volcanism and Sustained by Sea-Ice/Ocean Feedbacks," *Geophysical Research Letters* 39, no. 2 (2012): L02708. William F. Ruddiman, "The Anthropogenic Greenhouse Era Began Thousands of Years Ago," *Climatic Change* 61, no. 3 (2003): 261-93.

⁹⁴ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750.*, 931. These summer droughts created conditions optimal for city fires. See appendix I.

⁹⁵ *Ibid.*, 930.

The variability of this era conditioned a wider breadth of potential climate-induced disasters than if the period had been more tightly correlated to a distinct climatic regime. Drought and the resulting fires and shipworm epidemic, for instance, were more likely in the context of the dry summers after 1700. Storm surges responsive to a reduction in westerlies that predominated in colder decades would have made coastal floods more likely during the chillier period prior to 1700.⁹⁶ Extreme events occurred throughout this era, however. The worst flood disaster of the period of disaster (and one of the top three in storm severity during the eighteenth century) occurred in 1717.⁹⁷ The worst frosts of the era (1708/09 and 1739/1740) were also outliers. On the opposite token, summer drought conditions led to twenty-one city fires in the relatively wet last quarter of the seventeenth century.⁹⁸

These exceptional disasters underscore the difference between extreme weather events and longer climatic periods, and once again highlight the importance of evaluating disasters both in the context of events and as part of long-term processes. Disastrous weather often contributed to storm surges, epidemics, or harvest failures, but those same hazards need not be correlated to long-term climate regimes. They could be outliers. On the other hand, exceptional extreme events might also reveal the importance of the larger variability of climate, itself an important

⁹⁶ Coastal flooding was partly determined by the frequency and severity of storm surges. Although it is difficult to establish a connection between floods and temperatures, recent work using historical ship logbooks offers a clearer picture of storminess. Adriaan MJ de Kraker, "Reconstruction of Storm Frequency in the North Sea Area of the Preindustrial Period, 1400–1625 and the Connection with Reconstructed Time Series of Temperatures," *History of Meteorology* 2(2005): 51-69; D. Wheeler et al., "Atmospheric Circulation and Storminess Derived from Royal Navy Logbooks: 1685 to 1750," *An Interdisciplinary, International Journal Devoted to the Description, Causes and Implications of Climatic Change* 101, no. 1 (2010): 257-80.

⁹⁷ F Baart et al., "Using 18th Century Storm-Surge Data from the Dutch Coast to Improve the Confidence in Flood-Risk Estimates," *Natural Hazards and Earth System Sciences* 11(2011): 2791-801.

⁹⁸ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 907-908.

component of the relationship between societies and their environment. Many of the earliest historical climatologists already recognized that climate variability (in other words, short-term climatic fluctuations) had perhaps a greater impact on societies and economies than longer-term changes.⁹⁹ Scholars of climate variability and its impact of societies have largely focused on agricultural data showing disaster clusters. Back-to-back harvest failures, they contend, routinely led to epidemics and increased mortality.¹⁰⁰ Repeated extreme events certainly had detrimental impacts on economies and societies throughout Europe in the pre-modern period, but climate-induced disasters also entered into cascading relationships with disasters less or unconnected to climate. Disaster clusters integrated climate into a synergistic relationship with other conditions (some short, other long-term) that prompted catastrophe.

The period of disaster saw repeated clustering of climatic, economic, and social disasters. The intense storms in 1674 and 1675 depicted in Romein de Hooghe's *Ellende Klacht*, for instance, resulted in the toppling of the Domkerk in Utrecht and the Second All Saints Day Flood of 1675. While the storm hazards were indicative of the intensely variable climate of the late seventeenth century, it would be difficult to disentangle these impacts (particularly the flood) from the institutional and economic devastation of the *rampjaar* in 1672. Likewise, the stormy

⁹⁹ See, for instance, the chapters by John L. Anderson, Hermann Flohn, Hubert H. Lamb, and Christian Pfister in *Climate and History: Studies in Interdisciplinary History*, ed. Robert I. Rotberg and Theodore K. Rabb (Princeton, N.J.: Princeton, N.J.: Princeton University Press, 1981).

¹⁰⁰ John D Post, "Climatic Variability and the European Mortality Wave of the Early 1740s," *Journal of Interdisciplinary History* (1984): 1-30; John D. Post, *Food Shortage, Climatic Variability, and Epidemic Disease in Preindustrial Europe: The Mortality Peak in the Early 1740s* (Ithaca: Cornell University Press, 1985). S Engler et al., "The Irish Famine of 1740–1741: Famine Vulnerability and" Climate Migration", *Climate of the Past* 9, no. 3 (2013): 1161-79. Eric Vanhaute and Thijs Lambrecht, "Famine, Exchange Networks and the Village Community. A Comparative Analysis of the Subsistence Crises of the 1740s and the 1840s in Flanders," *Continuity and Change* 26, no. 02 (2011): 155-86. Bruce M. S. Campbell and Cormac Ó Gráda, "Harvest Shortfalls, Grain Prices, and Famines in Preindustrial England," *The Journal of Economic History* 71, no. 04 (2011): 859-86.

years between 1714 and 1720 produced nearly annual floods, the strongest of which was the Christmas Flood of 1717.¹⁰¹ Although these floods represent a dense cluster of extreme climatic events, it would be equally difficult to separate the impacts of cattle plague and the ongoing secular depression in Dutch agriculture from an assessment of their total impact. Cold temperatures and storminess were not the only significant clusters, either. Warm temperatures and an accumulation of drought years between 1731 and 1733 likely reduced the influx of fresh water into the Zuiderzee, raising salinities. These warm temperatures and high salinities likely conditioned the shipworm outbreak.

The nadir of the period of disaster during the 1740s and 1750s was the most telling example of the synergistic power of climatic and non-climatic influences on disaster. Severe cold, famine, pests, and epidemics affected the Netherlands and much of Western Europe in the early 1740s. While this project focused largely on the cattle plague epidemic beginning in 1744, this era is more widely known to demographers and economic historians as the site of a pan-European human mortality wave. Across Western Europe, human mortality spiked, and in the Low Countries, mortality increased by over 22 percent relative to the period from 1735-1739.¹⁰² On a continental scale, this extreme mortality was due to famine and resulting epidemics. These disasters were born out of a cluster of exceptionally cold seasons beginning with an incredibly cold winter in 1739 and lasting through a summer drought in 1742. Human and animal famine

¹⁰¹ Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, 929.

¹⁰² Post, "Climatic Variability and the European Mortality Wave of the Early 1740s," 13.

and epidemics were second-order consequences of climatic impacts on harvest and pasture growth.¹⁰³

A clear indication of the power of this synergy during the 1740s, and more broadly during the entire period of disasters was the frequency and intensity of social unrest. Uprisings, mob violence, and demonstrations against high food prices revealed the combined effect of disaster, economic uncertainty, and public dissatisfaction. Naturally, climate alone cannot explain famines and scarcity, much less social unrest resulting from those conditions. Unrest related to food prices was a rarity in the Golden Age, partly because the Dutch Republic could access vast stores of foreign grain via their markets. As a result, only a handful of violent actions took place during the entire era. Even in the dearth year of 1630 when food riots took place, they did not relate to weather, but to disruptions in the grain trade with the Baltic.¹⁰⁴

The post-Golden Age period of disaster, however, witnessed a growing amount of social unrest. Historian Rudolf Dekker tallied thirty total instances of food-related social unrest with most clustered during the period between 1693 and 1768. The 1740s saw the peak of unrest 1740s—precisely in line with the nadir of Dutch disaster.¹⁰⁵ This social unrest cannot be disentangled from its mutually reinforcing social, climatic, and economic roots. Even though human mortality rates decreased after 1742, the nadir of disaster was only beginning in the Netherlands. The mild spring and dry summer of 1742 may have initially seemed a godsend following the seasons of extreme cold and wetness preceding it, but these killing frosts

¹⁰³ Ibid., 6.

¹⁰⁴ Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen: 1575-1675*, 6 vols., vol. 4 (Franeker: Van Wijnen, 2000), 407.

¹⁰⁵ Dekker, *Holland in Beroering: Oproeren in De 17de En 18de Eeuw*, 24. See Appendix II.

suppressed mice populations. In 1742, mice returned with a vengeance, wreaking havoc on harvests and compounding the difficulties of previous years. Less than two years after this demographic, epidemiological, and economic catastrophe (and amidst the War of Austrian Succession), cattle plague entered the Netherlands for a second time in half a century.

Conclusion

Short and longer-term perspectives add value to the study of extreme events, and disaster more broadly. The disastrous climate of the early 1740s prompts one to reflect back on the print *Harde Winter* as a contemporary expression of this disaster event and its place in the broader story of Dutch decline. Interpretations of this print reflect the different manners of interpreting Dutch climate during this period of disaster. The print seems contradictory, depicting both playfulness and hardship. As with all discrete disaster events, the experience of disaster was uneven and mediated by social, cultural, and environmental factors. On this level, *Harde Winter* expresses the heterogeneity of climate during the period of disaster as well. From an environmental perspective, the winter of 1740 was an extreme event; it was an expression of weather. It joined a cluster of destructive weather events that seemed at odds with the milder decades immediately preceding and following it. Indeed, its exceptionality and distinctiveness as a meteorological event may have even contributed to its severe social impacts. Many contemporaries described the winter of 1740 as “the worst that anyone could remember” or so severe “that even the oldest people could not believe it.”¹⁰⁶ While undoubtedly a stock

¹⁰⁶ Simon Jacobsz. (?) Kraamer. *Eenijge Merckwaerdige Gebeurttenisse, Voorgevalle Bij Mijn Tijdt*. c. 1752. Doopsgezinde Gemeente Zaandam-West. KA 0012. 39.IV. Gemeentearchief Zaanstad, 7; Thadeus François Quint. *Nieuwe Tijdingen, Aantekeningen Betreffende Gebeurtenissen Uit De Jaren 1733-1744*. 1744. C. Berger, als burgemeester van Utrecht. 753. 127. Utrecht Archief, 67.

expression, these statements nevertheless demonstrate the value of cultural memory as an expression of climatic severity (1740 really was the coldest winter in a generation), but also reveal how exceptional observers considered this weather and how unprepared many were for it.

As a product of material culture, *Harde Winter* was also part of a longer tradition of winter landscapes in the Netherlands. The underlying symbolism of inversion, disaster, and decline only emerge out of this perspective. Similarly, the winter of 1740 was one episode in a climatically significant cluster of extreme conditions. The clustering of extreme events, many of which could be termed climate-induced disasters, was an important element of the period of disaster. Climate was only one component of a conjuncture of cultural, economic, and environmental changes that characterized decline between 1672 and 1764.

Conclusion

Dutch weather had been beautiful in the weeks leading up to April 5, 1702. The second half of March was warm and mild across much of Western Europe—a welcome respite from the cold, stormy weather of previous months. In the town *Koog aan de Zaan*, the merchant Claes Arisz Caescooper described the “very beautiful weather” in his journal that characterized “every day” between March 17 and April 4. In addition, the winds had been safely blowing from the southeast. On the evening of April 5, however, the weather changed and a “hard blustering” wind from the northwest created a storm surge that topped dikes across large areas of Holland.¹

¹ Jan Buisman, *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*, ed. A. F. V. van Engelen (Franeker: Van Wijnen, 2006), 285-286.



Figure C.1 Pieter van den Berge. *Depiction of the uncommonly High Flood in Holland and polders and villages of the same, and the Great Destruction that occurred there between the 5th and 6th of April, 1702.* (*Verbeelding van de ongemeene Hooge Waatervloed in Holland en polders en dorpen van dien, en de Groote Schade daar door geschiet, tusschen den 5 En 6 April Ao. 1702*), 1702. Van den Berge's print featuring Holland's "maid" surrounded by devastation is reminiscent of De Hooghe's *Ellende Klacht*, although it lacks its Golden Age optimism.

The flood of 1702 was regionally devastating. Storm winds pushed water over the dikes in areas both north and south of the IJ river. Although the major city in the region, Amsterdam, was largely spared, much of its hinterlands suffered extensive damage including many of the same areas inundated during the 1675 floods depicted by Romein de Hooghe in his *Ellende Klacht*. (Figure 1.2) This was one of many similarities. Print images depicting the flood of 1702 hearkened back to familiar themes evident since the disaster year of 1672. The etching “Depiction of an uncommonly high flood” printed by Pieter van den Berge in 1702 displays striking visual and thematic similarities to De Hooghe’s depiction of the disaster year. Just as in the earlier image, the “maiden” of Holland kneels surrounded by nature-induced devastation. Floodwaters pour through two breaches behind her as people and livestock struggle to escape the incoming flood tide. The water streaming through the rightmost breach have already destroyed one building, which lies ruined beneath rushing water. Storm winds knock bricks from the chimney of a house sitting on the dike. Similar to *Ellende Klacht* with its depictions of disasters in a variety of locations, this 1702 print also highlights scope. The maiden points with her left hand to a map of Holland with the inundated regions shaded a darker tint. Also, just as with the earlier print, images of providentialism abound. Figures standing on the dike lift their arms in appeal to divine intervention. The maiden’s expression and gesture with her right hand foregrounds their pleas and the accompanying text reinforced this meaning. “Who shall limit this great loss save God alone,” it states.²

² Anon., *Verbeelding Van De Ongemeene Hooge Waatervloed in Holland En Polders En Dorpen Van Dien, En De Groote Schade Daar Door Geschiet, Tusschen Den 5 En 6 April Ao. 1702*, 1702. Pieter van den Berge.

Despite these surface similarities, however, the providential meaning of this 1702 “Depiction” was subtly different in important ways that speak to larger changes in the meaning of disaster since 1672. De Hooghe’s print portrayed disaster as a trial by adversity. The Dutch had overcome many such trials since their revolt against Habsburg Spain and De Hooghe saw no reason why the *rampjaar* should introduce any enduring economic or political problems, much less lasting divine disfavor. His was a Golden Age vision of disaster. None of this optimism remains in the 1702 print. No Latin inscription promised a return to glory and the no new *stadhouder* from the House of Orange promised a “restoration of hope and peace.”³ Instead, the “maiden sits here in her mourning gown, bewailed; full of sorrow in her deplorable state.” “This treasure,” the text reads, “her prosperity [is] smothered in the tempestuous brine.”⁴ The 1702 print bespoke decline.

Nature-induced disaster defined the era of decline that followed the Dutch Golden Age. Post-Golden Age narratives tapped into a deepening well of popular concern with the declining moral condition of the Netherlands that predominated during the period between 1672 and 1764. Even during the high times of the Golden Age, demands for moral, cultural, and religious reform featured prominently in pamphlet literature, books, and poetry. Moral decay in the context of decline, however, characterized the disaster literature after 1672. According to the arithmetic of divine providence, Golden Age prosperity had indicated grace, whereas floods, shipworms, and cattle plague (as well as a host of other nature-induced disasters) were retribution for sin that

³ Romein de Hooghe, *Ellende Klacht Van Het Bedroefde Nederland Te Sedert Het Jaer 1672 Tot Den Aller-Heyligen Vloet Van Het Jaer 1675*, ed. Koninklijk Bibliotheek (Amsterdam: Romeyn de Hooge, 1675). In fact, William III had died in March of 1702 thus beginning the second “*stadhouder*-less period” in the Dutch Republic.

⁴ Anon., *Verbeelding Van De Ongemeene Hooge Waatervloed in Holland En Polders En Dorpen Van Dien, En De Groote Schade Daar Door Geschied, Tusschen Den 5 En 6 April Ao. 1702*.

reflected the changed moral condition of the Netherlands. The period between 1672 and 1764 featured a shocking profusion of these nature-induced disasters, which providentialists interpreted self-referentially. Each new disaster reinforced their causal stories of divine retribution and supported their use of providential remedies for both the immediate disaster and decline writ large. The narrative inversion of the Netherlands from a land of plenty to a realm of catastrophe was an important change since 1672.

Disaster and decline were also economically connected. Nature-induced disasters were expensive and their effects long lasting. Floods killed thousands of inhabitants, ruined harvests, and washed away homes and livestock. The shipworm epidemic prompted a costly restructuring of dikes along a huge expanse of coastline. Cattle plague was incredibly expensive for farmers and tradesmen dependent on animals and animal products. Provinces depended on a flourishing cattle market for taxes and when plague struck, every segment of society felt its cascading economic effects. Repeated disasters exacerbated the financial toll of events, sometimes extending their impacts by decades. These disasters all occurred in the context of assurgent social and cultural anxieties about the future state of Dutch trade and finances. These anxieties had been nascent in the aftermath of the *rampjaar*, but increasingly received national attention by the mid-eighteenth century. To contemporaries forced to abandon their lands or seek remittance from taxation, disasters reflected an increasing inability to cope with catastrophe during an era of decline.

Finally, contemporaries sought environmental connections and comparisons between disastrous events, often looking to new manners of interpreting and manipulating nature for insight. They placed environmental disasters in the context of vulnerability and longer-term trends in environmental change. Past disasters played an integral role in these stories as they

highlighted imbalances between natural and cultural relationships. Disasters also hindered or reversed Golden Age optimism regarding the control of nature. The vast expanses of land reclaimed during the Golden Age reflected both economic prosperity and increasing technological capacity. One of the areas inundated during the 1702 flood was a polder drained in precisely this economic context. The Bijlmer Lake (*Bijlmermeer*) southeast of Amsterdam developed in a process similar to many of the peat lakes of Holland where subsidence and erosion created and then expanded lake systems. Also similar to lakes elsewhere in Holland, investors drained the Bijlmer Lake in 1627 during the Golden Age reclamation push.⁵ The Bijlmer Lake was inundated during the *rampjaar*, however, and again in 1702. The difficulty and cost of re-draining the landscape during this era of economic and environmental upheaval prevented the Dutch from reclaiming this lake during the entire period of disaster (and beyond). Following the flood in 1702, the refilled Bijlmer Lake was both a symbol of an inverted ecological and economic situation as well as a sign of failing Golden Age optimism. In the context of an unstable climatic era, each of these realms of connection coalesced in a synergistic period defined by disaster and decline.

Although inversion, anxiety and destitution characterized much of this era, the Dutch did not react passively. The providential reading of disaster offered spiritual remedies that worked in tandem with secular responses. Nature-induced disasters also generated technological and medical innovations that revealed developing ideas about the human place in the natural world. Natural historians, physicians, and technocrats harnessed the past as well as ongoing and

⁵ Thimo de Nijs and Eelco Beukers, *Geschiedenis Van Holland* (Hilversum: Verloren, 2002), 112.

repeated disaster events to promote their optimistic ambitions for the control of nature. Water engineers used cultural memory of flooding in coordination with rhetoric of innovation to promote dike designs. The unprecedented scale and severity of disasters like the cattle plagues necessitated new medical ideas and a novel biological threat in the form of the shipworm demanded innovative technological solutions. The story of disaster and Dutch decline belies any uniformly declensionist characterization.

Instead, nature-induced disasters revealed an era of transition from the Golden Age into an uncertain future. For some, this future portended only further disasters “even more severe.” Much of this apprehension would be confirmed over the remainder of the century. The late eighteenth-century saw increasingly severe river flooding, a second outbreak of shipworms in the 1770s, and a third outbreak of cattle plague. For others, however, optimism never waned. By the 1750s, with the establishment of the first scientific institutions and the increasing tensions between innovators and exclusive providentialism, disasters had begun to yield institutions and rhetoric that assumed the early shapes of the Dutch enlightenment. Many of these nascent trends during this post-Golden Age period of disaster assumed revolutionary significance in the last half of the eighteenth-century. During this enlightenment era of disaster, nature-induced catastrophe (and a new French army) continued to threaten Dutch society and catalyze institutional, technological, and medical change. This later era of disaster saw the formation of quintessentially enlightenment-era institutions like centralized national water management (*Rijkswaterstaat*), expanded cattle inoculation programs supported by scientific societies and universities, and a national insurance program (*Veefonds*) to compensate farmers for cattle losses. The post-Golden Age period of disaster shaped Dutch decline, but it also nurtured this transition.

Bibliography

Archival Collections

- Gemeentearchief Delft. Delft, The Netherlands
Bibliotheek. B 17.664
- Gemeentearchief Zaanstad. Zaandam, The Netherlands.
Archief van Jacob Honig Jansz JR. 10.147
Doopsgezinde Gemeente Zaandam-West. KA 0012
- Gottfried Wilhelm Leibniz Bibliothek, Hannover, Germany.
Alte Drucke F-A 80.
- Groninger Archieven. Groningen, The Netherlands
Staten van Stad en Lande, 1594-1798. 1.
Ommelander Archieven, 1558-1862. 2.
Volle Gerecht van de stad Groningen, 1475 - 1811. 1534.
Plakkaten en ordonnanties GAG, 1595-1795. 2188.
Bibliotheek RAG (Losse Boeken).
- Hooghheemraadschap Amstel, Gooi, en Vecht, Amsterdam, The Netherlands.
Beeldmateriaal rechtsvoorgangers 80
- Nationaal Archief. The Hague, Netherlands.
Gedeputeerden van Haarlem ter Dagvaart. 3.01.09.
Gecommitteerde Raden van de Staten van Holland en West-Friesland, 1621-1795.
3.01.05
- Noord Hollands Archief. Haarlem, The Netherlands
Ambachtbestuur van Welsen. 3701.
Stads- en Gemeentebestuur van Beverwijk. 3769
- Regionaal Historisch Centrum Rijnstreek en Lopikerwaard, Woerden, The Netherlands.
DTB Registers Montfoort. M084.
- Stadsarchief Amsterdam. Amsterdam, The Netherlands
Archief van de Notarissen ter Standplaats Amsterdam. 5075
Archief van de Burgermeesters: publicaties van de Staten Generaal en van de Staten van
Holland en West Friesland. 5022.
Archief van de Burgermeesters: resoluties van de Staten van Holland en West-Friesland,
van Gecommitteerde Raden. 5038
Archief van de Notarissen ter Standplaats Amsterdam. 5075
- TRESOAR. Leeuwarden, The Netherlands
Gewestelijke bestuursinstellingen van Friesland 1580-1795. 5.
Verzameling Handschriften, afkomstig van de Provinciale Bibliotheek. 347.
Familiearchief Van Eysinga-Vegelin van Claerbergen. 323.
- Universiteit van Amsterdam. Amsterdam, The Netherlands
Bijzondere Collecties
- Utrecht Archief. Utrecht, The Netherlands
C. Berger, als burgemeester van Utrecht. 753.
Huis Zuylen. 76.
- Westfries Archief. Hoorn, The Netherlands
Ambacht van Westfriesland genaamd De Vier Noorder Koggen. 1562.

Stede en gemeente Grootebroek 1364-1949. 1107.
 Zeeuws Archief, Middelburg, The Netherlands.
 Zelandia Illustrata, Deel III (Historie en leven), 16^e-20^e eeuw. 296.

Newspapers

Europische Mercurius
 1718, 1732, 1744
 Gentleman's Magazine
 April 1755
 Leeuwarder Courant
 30 August 1769
 London Magazine: Or, Gentleman's Monthly Intelligencer
 1754
 Nederlandsche Jaerboeken
 1754, 1757
 's Gravenhaegse Courant
 18 Feb, 14 Sep, 14 Nov, 1746

Primary Sources

- Alta, Eelko. *Verhandelinghe over De Natuurlyke Oorzaaken Der Ziekte Onder Het Rund-Vee En Derzelver Langere Duuringe Als Te Vooren, Waar In ... De in-Enting Derzelve ... Wordt Aangepreezen: Gaande Vooraf Twee Vertoogen, Gezonden Aan De Hollandse Maatschappij Der Weetenschappen, Ter Beantwoording Eener Vraag over Deeze Stoffe in 1759 Voorgesteld En in 1760 Herhaald*. Leeuwarden: Wigerus Wigeri, 1765.
- Aglionby, William. *The Present State of the United Provinces of the Low-Countries: As to the Government, Laws, Forces, Riches, Manners, Customes [!], Revenue, and Territory, of the Dutch. In Three Books*. London: J. Starkey, 1671.
- Anon. *Aanwysinge Der Teeken en Van De Vreemde En Quaadaardige Siekte Onder Het Rundvee, Met Eenige Remedien Daar Tegen Uit Brabant En Holland Overgesonden: Op Orders Der Edele Mogende Heeren Gedeputeerde Staten Van Stadt En Lande Gedrukt*. 1744. Staten van Stad en Lande. 1. 485. Groninger Archieven.
- . *A New Description of Holland, and the Rest of the United Provinces in General: Containing Their Government, Laws, Religion, Policy, and Strength; Their Customs, Manners, and Riches; Their Trade to the Indies, and Their Fishery and Bank, with a Particular Account of Amsterdam, Hague, Rotterdam, and the Other Principal Cities, of Holland*. London: H. Rhodes, 1701.
- . *Bedenkingen, En Raad, Noopende De Tegenwoordige Stervte Onder Het Rundvee*. 's Gravenhage: Pieter van Thol, 1714.
- . *Beschryvinge, Van De Schade En Rasinge Aan De Zee-Dyken Van Noort-Hollanden West-Vriesland, Door De Worm in De Palen, En De Daar Op Gevolgde Storm, En Vervolgens: Waar by Komt Een Beschryving Van Een Nieuwe Water-Machine*. Hoorn: Jacob Duyn, 1732.
- . *Biblia, Dat Is: De Gantsche H. Schrifte (Statenvertaling 1637)*. Leiden: Paulus Aerts van Ravensteyn, 1637.
- . *De Nodige Gelatenheit in Elenden, De Ziele Voorgesteld in Ene Alleenspraak over 1 Sam. Iii: 18*. Leeuwarden: Pieter Koumans, 1745.

- *Dortse En Haagse Woonsdag En Saturdag, of Nader Opening Van De Bibliotheecq Van Mr. Jan De Witth, Zijnde Een Samenspraak Tusschen Een Hagenaar En Dortenaar.* s.n., 1672.
- *The Dutch Drawn to Life.* London: Tho. Johnson, and H. Marsh, 1664.
- *Een Historiesch Verhaal Van Veele En Nooit Meer Gehoorde Voorvallen Die Geschied Zyn in Verscheide Harde Winters Inzonderheid Van Den Jaare 1709 En 1740: Van Tyd Tot Tyd Aangetekend Door Een Liefhebber En Dus in 'T Ligt Gegeeven Met Een Fraaye Kopere Plaat.* Amsterdam: Arendt van Huyssteen and Steeve van Esveldt, 1740.
- *Een Historische Beschrijving Van Duure Tijden, En Hongersnoden.* Amsterdam: Arent van Huyssteen and Steeve van Esveldt, 1741.
- *Aanhangsel Van Eene Historiesche Beschryving Van Duure Tyden En Hongersnoden, En Wel Voornamentlyk Een Naaukeurig Vervolg Der Watervloeden, Die Ons Lieve Vaderland in 'T Laatste Van Den Jaare 1740 En in Den Beginnen Van Dit Jaar 1741 Zo Jammerlyk Getroffen Hebben, Doormengt Met Aanmerkelyke Gevallen En Gepaste Overdenkingen Om Den Zondaar Tot Inkeer Te Brengen ...: Vercierd Met Schoone Kopere Platen, Naar Het Leven Getekent.* Amsterdam: Arent van Huyssteen, 1741.
- *Het Bevel, Van De ... Heeren Staten, Gezonden Aan De Predikanten, in De Steede, Als Platte Lande, Om Te Waarschouwen, Het Sorgloos, En 'T Sondig Neederland; Tegen De Aanhoudende Bezoeking Van De Verslindende Seeworm.* Amsterdam: A. v. Monnem, 1732.
- *Het Sugtende Neederland Onder De Slaande Hand Gods, over De ... Sterfte Van Het Rund-Vee En Den ... Oorlog.* 's Hertogenbosch: H. van Irhoven, 1745.
- *Huysmans-Praetje, Voorgesteld Tot Onderrechtingh, Hoe Men Sich in Desen Verwerden En Murmureringe Toestandt Des Tijds Behoorden Te Dragen: En Met Eenem Om Tot Beter Verstant Des Oorsaecks Van De Tegenwoordige Bedroefden Toestant Des Tijds Te Komen: Tusschen Jacob, Klaes En Symon.* Amsterdam, 1672.
- *Klaag-Liet, Uitgeboesemt over De Inbreuke En Overstroming Der Vreeslyke Wateren Ontrent Zwolle, Kampen En Zutphen [...] Voorgevallen In't Laatste [...] Des Voorgaanden Jaars 1753. En in Het Begin [...] Deses Jaars 1754.* Maria van den Berge, 1754.
- *Nederlant Aengemaent Tot Boetvaardigheid.* 's Gravenhage: G. Block, 1732.
- *Omstandig Verhaal Van De Schrikkelijke En Nooit Gehoorde Watervloed, Voorgevallen in Engeland, Zeeland, Holland, Frisland, Groeningen En Duytsland, &C. Op Den 25 December 1717.* Middelburg: Johannes op Somer, 1718.
- *Opwekkende En Ziels-Lievende Uitnodiginge Van Een Heilzoekende Lief-Hebber Der Waerheid [...] Tot Het Sien Van De Kragt Godts, in De Plage [...] Der Wormen Aen De Zee-Dyken* ('s Gravenhage: van Zanten, Cornelis, 1732.
- *Remedien Tegen De Contagieuse Siekte Onder De Paarden En Hoornbeesten.* Groningen: Gesina Elama, 1732.
- *Veezorg, Herdersklagt over De Runderpest.* Dordrecht: Blusje en Zoon, 1755.
- *Verbeelding Van De Ongemeene Hooge Waatervloed in Holland En Polders En Dorpen Van Dien, En De Groote Schade Daar Door Geschied, Tusschen Den 5 En 6 April Ao. 1702.* Amsterdam: Pieter van den Berge, 1702.
- *Verhandelingen Uitgegeven Door De Hollandsche Maatschappye Der Weetenschappen Te Haarlem.* Vol. 21, Haarlem: Jan van Walre, 1784.

- Baerle, J.V., *Gedagten Van De Heeren Professoren Uytmakende De Medicynsche Faculteyt Op De Academie Van Utrecht over De Ziekte Onder Het Rund-Vee Thans Woedende: Waar by Nog Gevoegd Zyn Eenige Der Observatien, Uit Welke De Voornoemde Gedagten Zyn Opgemaakt*. Utrecht: Jacob van Poolsum, 1745.
- Balen, Matthys Jansz. *Beschryvinge Der Stad Dordrecht: Vervatende Haar Begin, Opkomst, Toeneming, En Verdere Stant; Opgezocht, in 'tlicht Gebracht, En Vertoond, Met Vele Voorname Voorrechten, Hand-Vesten, Keuren, En Oude-Herkomen; Als Mede Een Verzameling Van Eenige Geslachtboomen, Der Adellijke, Aal-Oude, En Aanzienlijke Heeren-Geslachten Van, En in, Dordrecht, Enz.* Dordrecht: Symon Onder de Linde, 1677.
- Barn in 't Loo, Hendrik van. *De Inwoonders Der Aarde Aangespoort Tot Een Betamelyke Vreze Voor Gods Teken, in En Aan Den Hemel: Handelende Van De Hemel-Ligten in 't Gemeen, Als Luidbare Verkondigers Van Gods Volmaaktheden, Maar in 't Byzonder Van De Comeeten*. Leiden: Johannes Hasebroek, 1744.
- Barueth, Johannes. *David's Wyze Keuze Uit Drie Plagen En Ware Boetvaardigheid Onder Gekoze Pestilentie: In Deze Dagen Van De Pest-Ziekte Onder Het Rundvee*. Rotterdam: Jacobus Bosch, 1745.
- Belkmeer, Cornelis, *Naturkundige Verhandeling of Waarneming, Betreffende Den Hout-Uytraspende En Doorbooren De Zee-Worm*. Amsterdam: J. Ratelband en Compagnie, 1733.
- Blom, Koenraad. *Hiskia's Dank- En Lof-Offer Voor Gods Wonderbare Genesing, Den Heere Toegebragt in Syn Dank-Schrift Jesaia 38 Vs. 16-20*. Amsterdam: Adrianus Douci, 1746.
- Byler, Hendrik Carel van. *Enige Nederlandse Watervloeden, Nevens Een Lyst Van De Gene Die in 't Jaar 1686, En Van Die, Dewelke in Het Jaar 1717. Op Kersdag Den 25 December Is Voorgevallen: Met Een Byvoeging Van Desselfs Aanmerkelijke Schade En Voorvallen. Zynde Hier Aangehegt Een Historis-Verhaal Van De Sterfte Die in De Vorige Eeuwen Onder Het Rund-Vee Geweest Is*. Groningen: Jurjen Spandaw, 1719.
- *Historis-Verhaal Van De Sterfte Die in Vorige Eeuwen Onder Het Rundvee, in Deze En Andere Landen Geweest Is, En Nog Duurt*. Groningen: Jurjen Spandaw, 1719.
- C.J. Korte *Beschryvinge Van De Schrikkelijke Watervloed, Veroorsaekt Door Een Sterke Stormvint/Voorgevallen Tusschen Den 24. En 25. December 1717: Soo in Holland/Friesland/Groninger-Embder En Oost-Friesland*. Leeuwarden: Johannes Thijssens, 1718.
- Centen, I., *Gods Oordelen over Nederland, in De Sterfte Van't Rundvee, Den Zwaren Storm, En Hogen Watervloed*. Amsterdam: Johannes Oosterwijk, 1718.
- Cheseaux de, Jean-Philippe Loys de *Traité De La Comète Qui a Paru En Décembre 1743 & En Janvier, Février & Mars 1744: Contenant Outre Les Observations De L'auteur, Celles Qui Ont Été Faites À Paris Par Mr. Cassini & À Geneve Par Mr. Calandrini : On Y a Joint Diverses Observations & Dissertations Astronomiques, Le Tout Accompagné De Figures En Taille Douce*. Lausanne: Chez Marc-Michel Bousquet & Compagnie, 1744.
- Costerus, Bernard. *Historisch Verhaal...Raakende Het Formeren Van De Republiek Van Holland Ende West-Vriesland*. Leiden: Coenraad Wishoff, 1736.
- Crous, A.E. *Opregt En Nauwkeurig Historis-Verhaal Van De Verwonderenswaardige, Droevige, Schrikkelike En Seer Schaadelike Waters-Vloed, Voorgevallen in De Provincie Van Groningen En Ommelanden, Op Kersdag Den 25. December Ao. 1717: Daarom Met Regt Genaamt De Kers-Vloed of Midwinters-Vloed. : Met Al 't Geene in Deselve,*

- Aanmerkelijk Is Voorgevallen ... : Beneevens Een Byvoegsel Van 'T Aangrensend Oost-Vriesland, En De Daar Bygeleegene.* Seerp Bandsma, 1719.
- Duyn, Nicolaas. *Aanmerkingen En Aanteekeningen Van Drie Meer Dan Gemeene Strenghe Winters: Als Die Van Den Jaaren 1708 En 1709, Die Van 1739 En 1740, En Die Zeer Strenghe Wintermaand Van 1742, Als Meede Meer Andere Nuttig-Weetende Zaaken.* Haarlem: Izaak Vander Vinne, 1744.
- Engelhardt, Henricus, *Goede Suffisante, Gods Verleende, Uitgevondene Middelen, Omme Yzere, En Steene Zeemuuren, Met Paalen Zonder Metzelwerk, Tegens Het Schadelyke Zeegewormte Te Maken, Dewelke in Plaats Van Zeedyken, Dammen, En in De Zehavens Zoude Kunnen Dienen.* 's Gravenhage: Laurens Berkoske, 1733.
- Engelman, Jan. "Nader Verhandeling over De Rundveesterfte, Betreklyk Tot De Waarneemingen, Vervat in 'T Vide Deels Iide Stuk." *Verhandelingen van de Hollandsche Maatschappye der Wetenschappen* 7 (1762): 247-318.
- . *Waarnemingen in De Rundveesterfte in 1756 En 1759, Dienende Tot Een Voorloper Ter Nader Verhandeling over Dezelfde Stoffe.* Hollandsche Maatschappye Der Wetenschappen, Te Haarlem. Vol. 6, Haarlem: J. Bosch, 1760.
- Gabbema, Simon Abbes. *Nederlandse Watervloeden, of Naukeurige Beschrijvinge Van Alle Watervloeden Voorgevallen in Holland ... En De Naabuirige Landen.* Gouda: Lucas Cloppenburg, 1703.
- Gennep, A. Van. *Het Hertnypend En Besmettelyk Sterven Onder Het Rundvee, by Wyze Van Waarschouwing, Tot Voorkoming Van Swaarder Straffen Onder Het Menschdom.* Breda: Willem Goetzee, 1745.
- Gouthoeven, Wouter van. *D' Oude Chronijcke Ende Historien Van Holland (Met West-Vriesland) Van Zeeland Ende Van Utrecht.* Dordrecht: Peeter Verhaghen, 1620.
- Grashuis, J. "Berigt Aangaande De in-Enting Der Besmetlyke Ziekte in Het Rundvee in Een Aanmerkelyk Getal Beesten Te Werk Gesteld, En Tot Verdere Beproeving Onze Landgenooten Voorgehouden Door Den Heer J.G.". In *Uitgezogte Verhandelingen Uit De Nieuwste Werken Van De Societeiten Der Wetenschappen in Europa En Van Andere Geleerde Mannen.* Amsterdam: F. Houttuyn, 1758.
- Gyzen, Jan van. *Jan Van Gyzen's Klaagend Nederland, Bezogt Met Sterfte Onder Het Rundvee, En Swaare Storm Winden, Voorgevallen 26 En 27 Febr. En 6 En 7 Maart 1714.* Amsterdam: Jacobus van Egmont, 1714.
- H.F., *Treurdigt Ter Droeviger Gedagtenisse Van De Vreeselyken En Verderffelyken Watervloed Den 25sten Van Wintermaan Mdccxvii En Enige Volgende Dagen, Gebragt Oover Holland, Friesland, Omlanden En Derselver Naburen.* Amsterdam: Johannes Douci, 1718.
- Haen, Anton de, Wilhelm Ouwens, Cornelis Henricus Velse, and Abraham Westerhoff. *Verhandeling Van De Tegenwoordige Ziekte En Sterfte Van Het Rundvee, Met Waarnemingen Opgehelderd, Door Vier Geneesheeren.* The Hague: De Haen, 1745.
- Halma, François. *Godts Wraakzwaardt over Nederlandt, Vertoont in De Zwaare Sterfte Onder 'T Rundtvee.* Leeuwarden: François Halma, 1714.
- Hardeveldt, Anthonie van *De Verbaasde En Erbarmlyke Vlucht Der Inwoonderen Des Landts Van Heusden, Wegens De Laatste Verschrikkelyke Overstrominge, Vertoont in Eene Predikatie, over Matth. Xxiii: Vers 20: Met Een Dank-Addres Aan De Chasidim of Weldadigen.* Dordrecht: Fredrik Oudman, 1741.

- Harkenroht, Jacobus Iserbrandi. *Kerkrede over Oostfrieslands Kerstvloed Den 25 December Des Jaars 1717 ... Op Den Eersten Zondag Des Jaars 1718, Den 2 Januarij Aan De Gemeente Te Larrelt Aan Den Eems in Oostfriesland, Nevens Een Kort Ontwerp Van Deezen Laasten Kersvloed 1717*. Embden: by H. van Senden, 1721.
- *Kerkrede over Oostfrieslands Rundvees Pest, Gevreest, En Helaas Gekoomen, Aangetoont Uit Jes: Vii. Vs. 21. ... Op Een Maandelijke Bededag Aan De Gemeente Te Larrelt in Oostfriesland*. Embden: Enoch Brantgum, 1716.
- *Worm in Nederlands Paalwerk Voor De Zeedyken*. Groningen: Harmannus Spoormaker en Laurens Groenwout, 1733.
- Hooghe, Romein de, *Ellende Klacht Van Het Bedroefde Nederland Te Sedert Het Jaer 1672 Tot Den Aller-Heyligen Vloet Van Het Jaer 1675*, ed. Koninklijk Bibliotheek. Amsterdam: Romeyn de Hooge, 1675.
- Kemner, J. *De Suchtende Landtman in De Provincie Van Stadt Groningen En Ommelanden over De Hooge Water-Vloedt Op Kers-Tydt Den 25. Van Winter-Maandt in Het Jaar Onses Heeren 1717*. Groningen: Johannes van Velsen, 1718.
- *Monstreuse Zeewurm Doorknagende Het Posten Paalwerk in De Provincie Van Stadt En Lande En Wel Voornamentlyk in De Nabuirige Provincie Van Vriesland in Het Jaar 1732*. Groningen: Pieter Bandsma, 1732.
- L'Epie, Zacharias. *Onderzoek over De Oude En Tegenwoordige Natuurlyke Gesteldheyd Van Holland Dog Voornamentlyk West-Vriesland Ten Opzigte Van Deszelfs Rivieren En Landen, Aanwas, Ophooging, Zakking, Laagte En Dykagie...* Amsterdam: Erven van J. Ratelband, 1734.
- *Onderzoek over De Oude En Tegenwoordige Natuurlyke Gesteldheyd Van Holland En West-Vriesland, Desselfs Rivieren En Landen, Aanwas, Ophooping, Zakking, Laagte En Dykagie ... : Mitsg. Eene Verhandeling over De Zee- of Kokerwormen : Als Mede De Middelen Tot Versterking Der Zee-Weeringen*. J. Hayman, 1753.
- Lakenman, Seger, *Het Wonder Oordeel Godts, Ofte Een Kort Verhaal Van De Ongehoorde Bezoeking Dezer Provintie Door Zekere Plage Van Zee- Wormen*, ed. Dykgraad en Heemraden en Waarschappen van Drechterland. 1732.
- Layard, Daniel Peter. "A Discourse on the Usefulness of Inoculation of the Horned Cattle to Prevent the Contagious Distemper among Them. In a Letter to the Right Hon. George Earl of Macclesfield, P. R. S. From Daniel Peter Layard, M. D. F. R. S.". In *Philosophical Transactions*, 528-38, 1758.
- Liesveldt, Pieter, *Neerlands Oordeel, Ofte Levendig Vertoog Van De Slaande Hand Gods, over De Bedroefde Sterfte Onder Het Rund-Vee. Voorgesteld in Een Saamenspraak*. Nieuwkoop: Joh. van Abkoude, 1745.
- Linné, Carl *Systema Naturæ Per Regna Tria Naturæ, Secundum Classses, Ordines, Genera, Species, Cum Characteribus, Differentiis, Synonymis, Locis*. Holmiae: Salvius, 1758.
- Luyken, Jan. *De Bykorf Des Gemoeds, Honing Zaaamelende Uit Allerly Bloemen. Vervattende over De Honderd Konstige Figuren. Met Godlyke Spreuken En Stichtelyke Verzen*. Amsterdam: Arentz, P., 1711.
- Marchant, Jan. *Naagalm over De Vee-Ziekte, Met Een Jaarlijst Der Voorgaande Vee-Sterftes, Sédert De Plagen Van Egipten: Alsmede De Waare Oorzaak Der Koeje-Ziekte, En De Middelen Om Die Voor Te Koomen*. Haarlem: J. Marshoorn en Iz. vander Vinne, 1745.
- Massuet, Pierre. *Wetenswaardig Onderzoek over Den Oorsprongk, De Voortteling, De Ontzwachteling, Het Maaksel, De Gedaante, De Gesteltheit, Den Arbeidt, En De*

- Verbazende Menigte Der Verscheide Soorten Van Kokerwurmen Die De Dykpalen En Schepen Van Enige Der Vereenigde Nederlandsche Provintsien Doorboren.* Amsterdam: Wor, 1733.
- Mills, John. *A Treatise on Cattle: Shewing the Most Approved Methods of Breeding, Rearing, and Fitting for Use, Horses, Asses, Mules, Horned Cattle, Sheep, Goats, and Swine ; with Directions for the Proper Treatment of Them in Their Several Disorders ; to Which Is Added, a Dissertation on Their Contagious Diseases.* Dublin: W. Whitestone, 1776.
- Missy, Jean Rousset de, *Aanmerkingen over Den Oorsprong, Gesteltheit, En Aard Der Zeewormen: Die De Schepen En Paal-Werken Doorboren Door Den Hr. Rousset.* Leiden: Gysbert Langerak, 1733.
- *Observations on the Sea- or Pile-Worms Which Have Been Lately Discover'd to Have Made Great Ravages in the Pile-or Wood-Works on the Coast of Holland, &C: Containing a Particular Account of Their Make and Nature, and of the Use of Their Several Parts in Boreing and Feeding; with a Particular Description of Their Cells or Lodgments in the Wood.* London: J. Roberts, 1733.
- Mobachius, Johannes A. *De Almagtige En Regtveerdige Slaande Hand Gods, Ter Besoeking Van Het Land En Deese Provincie Met De Verderfelyke Plage Der Zeewormen, Vertoond En Aangedrongen Uit Nahum I: Vs. 3; Op Den Plegtelyken Vast-En Bid-Dag, Gehouden in De Provincie Van Groningen Ende Ommelanden, Den 8 Octob. 1732 ...; Al Waar Met Een Ingevoegt Is Een Beschrijving Van De Gedaante En Grootte Der Zeewormen, En Hoe Die De Dijkpalen Doorboren Nevens Een Afbeelding Daarvan.* Groningen: Jurjen Spandaw, 1733.
- *Den Vrezelyken Zamenloop Van Veele Gedugte Oordelen Gods, Als Van Alverwoestende Oorlogen, Swaere Overstromingen, Ontzachelyke Aerdbevingen, Aenhoudende, En Meer En Meer Woedende Runder-Pest, Enz. Enz.: Als Zoo Veele Voorboden Van Een en Geheelen Ondergang, Zoo Het Niet Door Eene Spoedige Beking Werde Voorgekomen: In Der Zelfer Naere Omstandigheden Vertoond Uyt Ps. Xlvi : 2-9. Op Den Jongsten Biddag Dezes Jaers 1760, Den 20. Febr.* Gorinchem: Teunis Horneer, 1760.
- *Groningerlands Zeer Hooge En Schrikkelyke Watervloed ... Op Kerst-Tyd Den 25 Decemb. 1717: Verhandeld ... Op Den Eersten Biddag, Gehouden in Groningerland, Den 5 Jan 1718. En Daar Na Uitgebreid, En Ter Gedagtenis in 'T Ligt Gegeven.* Groningen: Jurjen Spandaw, 1718.
- Munck, Jan de. *Sterrekundige Waarneemingen Op De Comeet of Staart-Sterre Sedert Den 29 November ... 1743 Tot Op Den L Maart ... 1744.* 1744.
- Nieuwentijdt, Bernard. *Het Regt Gebruik Der Werelt Beschouwingen Ter Overtuigingen Van Ongodisten En Ongelovigen.* Amsterdam: Joannes Pauli, 1714.
- Nozeman, Cornelius, Agge Roskam Kool, and Jan Tak. *Eerste Proefneeming over De Uitwerkingen Van De Inenting Der Besmettende Ziekte in Het Rundvee, Gedaan in De Beverwijk.* Amsterdam: K. van der Sys en K. de Veer, 1755.
- Oudheusden, A.W.K.V van. *Historische Beschryvinge Van Culemborg; Behelzende Een Naemlijst Der Heeren Van Bosichem, Benevens Der Heeren En Graeven Van Culemborg ...: Mitsgaders Een Beschryvinge Van De Stad Culemborg.* Utrecht: J. H. Vonk van Lynden, 1753.

- Outhof, Gerardus. *Damon. Ofte Herdersklagte over De Sterfte Onder't Rundvee [...] Waar Mede Godt Oostvrieslandt [...] Bezoekt*. Emden: wed. E. Tremel, H. van Senden, for E. Brantgum, 1716.
- . *Gerhardus Outhofs Verhaal Van Alle Hooge Watervloeden, in Meest Alle Plaatsen Van Europa, Van Noachs Tydt Af, Tot Op Den Tegenwoordigen Tydt Toe: Met Een Nieuw Kaertje Van't Verdrongen Landt in Den Dollaart, Afbeeldinge Van Kosmas En Damianus En Van Den Steenenman in Vrieslandt: Met Eene Breede Beschryvinge Van Den Zwaaren Kersvloedt Van 1717, En Bygevoegde Tafels Der Watervloeden*. Embden: H. van Senden, 1720.
- Propositie Van Syne Hoogheid Ter Vergaderingen Van Haar Hoog Mogende En Haar Edele Groot Mog. Gedaan, Tot Redres En Verbeeteringe Van Den Koophandel in De Republicq. 's Gravenhage*: Jacobus Scheltus, 1751.
- R.B. *Nederlands Klachte over Gods Naekende Oordeelen : Duidelyk Te Bespeuren in Het Knaegen Der Wormen Aen De Paelen Der Nederlandze Zeedyken : Ter Gelegenheid Van Den Dank, Vast- En Bededag, Uitgeschreven by De Heeren Staeten Van Vriesland, Tegens Woensdag Den 3en Van Herfstmaend Des Jaers 1732*. Harlingen: Folkert Jansz van der Plaetz, 1732.
- Raye, Jacob Bicker *Het Dagboek Van Jacob Bicker Raye, 1732-1772 : Naar Het Oorspronkelijk Dagboek Medegedeeld*. edited by F. Beijerinck and Michiel George de Boer. Amsterdam: H.J. Paris, 1935.
- Schwenke, Thomas. "A Letter from Dr. Swencke, Professor of Anatomy and Surgery at the Hague, on the Subject of Inoculating Horned Cattle." In *Gentleman's Magazine*. London: D. Henry and R. Cave, 1755.
- . "Schreiben Des Herrn Doct. Swenke Der Anatomie Und Chirurgie Professors Im Haag Die Einpropfung Des Hornviehs Betreffend." In *Bremisches Magazin Zur Ausbreitung Der Wissenschaften, Künste Und Tugend*, 406-08. Hannover: Nicolai Forsters and Sohns Erben, 1756.
- Seffinga, Meindert. *Resoluties Van De Staten Van Friesland, 1711-1720*. Gewestelijke bestuursinstellingen van Friesland 1580-1795 - Nadere Toegang. 5. 26. TRESOAR.
- . *Resoluties Van De Staten Van Friesland, 1731-1750*. Gewestelijke bestuursinstellingen van Friesland 1580-1795 - Nadere Toegang. 5. 26. TRESOAR.
- Sellius, Gottfried. *Natuurkundige Histori Van Den Zeehoutworm, Ofte Houtvreeter, Zynde Koker- En Meerschelpigh, Inzonderheit Van Den Nederlantschen ...: Eerste Deel*. Utrecht: H. Besseling, 1733.
- Short, Thomas. *A General Chronological History of the Air, Weather, Seasons, Meteors, &C. In Sundry Places and Different Times: More Particularly for the Space of 250 Years : Together with Some of Their Most Remarkable Effects on Animal (Especially Human) Bodies and Vegetables*. London: T. Longman and A. Millar, 1749.
- Sluiter, Johannes. *Vernedert Nederlant, of Klagte over Nederlants Sonden, Gestraft Door De Sterfte Van Het Rundvee*. Steenwyk: Pieter and Hendrik Stuyfzant, 1715.
- Smids, Ludolf. *Diluviana of Daghwysen Der Nederlandsche Waternooden Van Het Jaar 793 Tot Deesen Laatsten Van Den 25 November Des Verledene Jaars 1717*. Amsteldam: Hendrik vande Gaete, 1718.
- Smit, Jan. *Gods Slaandehand over Nederland, Door De Pest-Siekte Onder Het Rund Vee Naar Het Leeven Getekent, En Gegraveert Door Jan Smit*. Amsterdam: Steven van Esveldt, 1745.

- Straat, Pieter, and Pieter van der Deure, *Ontwerp Tot Een Minst Kostbaare Zeekerste En Schielykste Herstelling Van De Zorgelyke Toestand Der Westfriesche Zeedyken... Met Een Nader Ontwerp Hoe Men De Dyken Daar De Grootste Dieptens Zyn Op De Zekerste, Minst Kostbaarste En Schielykste Wyze Kan Herstellen...* Door Pieter Straat En Pieter Van Der Deure. Amsterdam: J. Oosterwyk, 1733.
- T, L., and J. B., *Nederlant Ten Toneele, Van Godts Regtvaardige Wormstraf Gekozen*. Groningen: Laurens Groenewout, 1732.
- Temple, William. *Observations Upon the United Provinces of the Netherlands. By Sir William Temple of Shene, in the County of Surrey, Baronet, Ambassador at the Hague, and at Aix La Chapelle, in the Year 1668*. 7th ed. London: Jacob Tonson, 1705.
- van Assen, W. *Vertooninge Van Onheilen Door De Zonde Veroorzaakt: Toegepast Op De Tegenwoordige, Van Gods Handt Regtveerdig Toegezondene Worm-Plaag*. Leeuwarden: Pieter Koumans, 1732.
- Velsen, Cornelis. *Aanmerkingen Van Cornelis Velsen Geadmitteert Landmeeter, Op De Zeerlangduurige En Naauwkeurige Observatien, Omtrent De Rivieren De Wael, Maas, Merwede En Leck Tot Aan Zee Gedaan; Aantoonende Hoe Sig Die Verdorven Hebben, Als Mede Het Gevaar Waar in De Provinciën, Gelderland, Holland, Utrecht En Overijssel, Sig Bevinden, Indien 'Er Geen Spoedige Hulpmiddelen Werden Aangewent, Waar Van De Eenigste Die Te Vinden Zyn, Werden Vertoont &Cc. Door Justus Van Den Burchgraaf*. Leiden: Daniel Goetval, 1744.
- . *Rivierkundige Verhandeling, Afgeleid Uit Waterwigt En Waterbeweegkundige Grondbeginselen, En Toepasselyk Gemaakt Op De Rivieren Den Rhyn, De Maas, De Waal, De Merwede En De Lek*. Amsterdam: Is. Tirion, 1749.
- Wyckel, J.S. van. *Placcaat. Uitschryving Van Den Algemeenen Dank- Vast- En Beeden-Dag, Gehouden Binnen [...] Vriesland, Op Woensdag Den 3. September 1732*. 's Gravenhage: Zanten, Cornelis van, 1732.

Secondary Sources

- 't Hart, Marjolein. "Town and Country in the Netherlands, 1550-1750." In *Town and Country in Europe, 1300-1800*, edited by S. R. Epstein, 80-105. Cambridge: Cambridge University Press, 2001.
- Aalbers, J. "Holland's Financial Problems (1713-1733) and the Wars against Louis XIV." *Britain and the Netherlands* 6 (1978): 79-93.
- Abbing, Cornelis Alard. *Geschiedenis Der Stad Hoorn, Hoofdstad Van West-Vriesland Gedurende Het Grootste Gedeelte Der 17e En 18e Eeuw, of Vervolg Op Velius Chronyk*. Vol. 2, Hoorn: Gebr. Vermande, 1842.
- Adrichem, D. van. "Een Nieuwe Devotie Door De Vee-Ziekte Van 1744." *Archief voor de geschiedenis van het aartsbisdom Utrecht* 42 (1916): 373-83.
- Allemeyer, Marie Luisa. *"Kein Land Ohne Deich-- !": Lebenswelten Einer Küstengesellschaft in Der Frühen Neuzeit*. Göttingen: Vandenhoeck & Ruprecht, 2006.
- Anon. "Iets over den Kersvloed van 1717," *Groninger Volksalmanak Voor Het Schrikkeljaar 1848*. Vol. 12, Groningen: A. Oomkens, J. Zoon, 1848.
- Appuhn, Karl. "Ecologies of Beef: Eighteenth-Century Epizootics and the Environmental History of Early Modern Europe." *Environmental History* 15, no. 2 (2010): 268-87.

- Baars, C. "De Paalwormfurie Van 1731-1732 En De Schade Aan De West-Fries Zeedijk." *Waterschapsbelangen* 73 (1988): 809-15.
- "Herstel Van De Paalwormschade Aan De Zuiderzee Dijken Beoosten Muiden." *Waterschapsbelangen* 74 (1989): 437-46.
- "Nabeschouwing over De Paalwormplaag Van 1731-32 En De Gevolgen Daarvan." *Waterschapsbelangen* 75 (1990): 505-09.
- Baart, F, MAJ Bakker, A Van Dongeren, C Den Heijer, S Van Heteren, MWJ Smit, M Van Koningsveld, and A Pool. "Using 18th Century Storm-Surge Data from the Dutch Coast to Improve the Confidence in Flood-Risk Estimates." *Natural Hazards and Earth System Sciences* 11 (2011): 2791-801.
- Baart, K. *Westkapelle, Hare Bevolking, Westkapelsche Dijk ... Met Twee Kaarten*. 1889.
- Bakker, J. *Stormvloeden!: Uit Oude Kronieken Bijeenvergaard En Breedvoerig Omschreven, Vanaf 1625 Tot En Met Januari 1916, Welke in 'T Bijzonder Ons Land Hebben Geteisterd, Alsmede Beschrijving Omtrent Het Ontstaan Van "De Dollard", Met Een Kaart Van Het Verdronken "Reiderland"*. Bakker/Scheemda, 1925.
- Bakker, J.A. *Megalithic Research in the Netherlands, 1547-1911: From "Giant's Beds" and "Pillars of Hercules" to Accurate Investigations*. Leiden: Sidestone Press, 2010.
- Bankoff, Greg. "Comparing Vulnerabilities: Toward Charting an Historical Trajectory of Disasters." *Historical Social Research / Historische Sozialforschung* 32, no. 3 (121) (2007): 103-14.
- *Cultures of Disaster: Society and Natural Hazard in the Philippines*. New York: Taylor & Francis, 2003.
- "The 'English Lowlands' and the North Sea Basin System: A History of Shared Risk." *Environment and History* 19, no. 1 (2013): 3-37.
- Bartels, Michiel H. "De Spuiter Uit 1659, Een Archeologisch Onderzoek." *West Friesland: Oud en Nieuw* (2012): 71-92.
- "Zeven Keer Door De Zuiderdijk." *West-Friesland Oud & Nieuw* 78 (2011): 69-77.
- Bazin, Hervé. *Vaccinations: A History: From Lady Montagu to Jenner and Genetic Engineering*. Esher: John Libbey Eurotext, 2011.
- Beck, Ulrich. *Risk Society: Towards a New Modernity*. London: SAGE Publications, 1992.
- Beekman, A.A. *Het Dijk- En Waterschapsrecht in Nederland Vóór 1795*. Vol. 2, 's Gravenhage: M. Nijhoff, 1907.
- Behringer, Wolfgang. *A Cultural History of Climate*. Cambridge: Cambridge : Polity, 2010.
- "Der Krise Von 1570. Ein Beitrag Zur Krisengeschichte Der Neuzeit." In *Um Himmels Willen: Religion in Katastrophenzeiten*, edited by Manfred Jakubowski-Tiessen and Harmut Lehmann, 51-156. Göttingen: Vandenhoeck & Ruprecht, 2003.
- "Kleine Eiszeit" Und Frühe Neuzeit." In *Kulturelle Konsequenzen Der "Kleine Eiszeit"*, edited by Wolfgang Behringer, Hartmut Lehmann and Christian Pfister. Göttingen: Vandenhoeck & Ruprecht, 2005.
- Beinart, William, and Karen Brown. *African Local Knowledge & Livestock Health : Traditional, Environmental & Biomedical Approaches in South Africa*. Oxford: James Currey, 2013.
- Benedict, Philip, and Myron P. Gutmann. *Early Modern Europe: From Crisis to Stability*. Newark: University of Delaware Press, 2005.
- Berger, Hubertus Cornelis Leonard Emile. "De Ontwikkelingsgang Van Overheidsmaatregelen in Nederland Tegen Besmettelijke Veeziekten." *Jaarboek der Rijksuniversiteit te Utrecht* (1930).

- Bieleman, Jan. *Boeren in Nederland: Geschiedenis Van De Landbouw 1500-2000*. Amsterdam: Boom, 2008.
- . *Boeren Op Het Drentse Zand, 1600-1910: Een Nieuwe Visie Op De "Oude" Landbouw*. Afd. Agrarische Geschiedenis, Landbouwuniversiteit, 1987.
- . *Geschiedenis Van De Landbouw in Nederland, 1500-1950: Veranderingen En Verscheidenheid*. Meppel: Boom, 1992.
- Biesterveld, P., and H.H. Kuyper. *Kerkelijk Handboekje: Bevattende De Bepalingen Der Nederlandsche Synod En Andere Stukken Ven Beteekenis Voor De Regeering Der Kerk*. Kampen: J.H. Bos, 1905.
- Birkland, Thomas A. *After Disaster : Agenda Setting, Public Policy, and Focusing Events*. Washington, D.C.: Georgetown University Press, 1997.
- Blancou, Jean. *History of the Surveillance and Control of Transmissible Animal Diseases*. Office international des épizooties, 2003.
- Boon, J.G.M. "Historische Aantekeningen Van Een Pastoor." *Heemtydinghen: Orgaan voor de Streekgeschiedenis van het Stichts-Hollandse Grensgebied* 8, no. 15 (1965): 6-9.
- Boon, L.J. *Dien Godlosen Hoop Van Menschen: Vervolging Van Homoseksuelen in De Republiek in De Jaren Dertig Van De Achttiende Eeuw*. Amsterdam: De Bataafsche Leeuw, 1997.
- Boon, Piet. "Voorland En Inlagen: De Westfrieze Strijd Tegen Het Buitenwater." *West-Frieslands Oud en Nieuw* 58 (1991): 78-113.
- Borger, Guus J., Philippus Breuker, and Hylkje de Jong. *Van Groningen Tot Zeeland: Geschiedenis Van Het Cultuurhistorisch Onderzoek Naar Het Kustlandschap*. Hilversum: Verloren, 2010.
- Bos, C.K., S. Ullsberg, and P 't Hart. "The Long Shadow of Disaster: Memory and Politics in Holland and Sweden." *International Journal of Mass Emergencies and Disasters* 23 (2005): 5-16.
- Bosch, Toon. "Hulpverlening Van Catastrofale Watersnoden in De Nederlandse Delta, 1740-1861." *Streven: Cultureel Maatschappelijk Maandblad* (2011): 509-20.
- . *Om De Macht over Het Water: De Nationale Waterstaatsdienst Tussen Staat En Samenleving, 1798-1849*. Zaltbommel: Europese Bibliotheek, 2000.
- Boschma, C. *Meesterlijk Vee: Nederlandse Veeschilders 1600-1900*. Zwolle: Waanders, 1988.
- Botke, IJ. *Boer En Heer: "De Groninger Boer" 1760-1960*. Koninklijke van Gorcum, 2002.
- Boxer, C. R. "The Dutch Economic Decline." In *Economic Decline of Empires*, edited by Carlo Cipolla, 235-63. London: Routledge, 1970.
- Brantz, Dorothee. "'Risky Business': Disease, Disaster and the Unintended Consequences of Epizootics in Eighteenth-and Nineteenth-Century France and Germany." *Environment and History* 17, no. 1 (2011): 35-51.
- Brázdil, Rudolf, Christian Pfister, Heinz Wanner, Hans Storch, and Jürg Luterbacher. "Historical Climatology in Europe – the State of the Art." *Climatic Change* 70, no. 3 (2005): 363-430.
- Brink, P. van den. *"In Een Opslag Van Het Oog": De Hollandse Rivierkartografie En Waterstaatszorg in Opkomst, 1725-1754*. Alphen aan den Rijn: Canaletto/Repro-Holland, 1998.
- Broad, John. "Cattle Plague in Eighteenth-Century England." *The Agricultural History Review* (1983): 104-15.

- Brouwer, Henk. "Malaria in Nederland in De Acttiende En Negentiende Eeuw." *Tijdschrift voor Sociale Geschiedenis* 9 (1983): 141-59.
- Brown, Karen, and Daniel Gilfoyle. *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*. Athens: Ohio University Press, 2010.
- Bruin, J. de, and D. Aten. *Een Gemene Dijk?: Verwikkelingen Rond De Dijkzorg in West-Friesland : De Watersnood Van 1675-1676*. Purmerend: Vrienden van de Hondsbossche, Kring voor Noord-Hollandse waterstaatsgeschiedenis, 2004.
- Bühlmann, Jost. "Beitrag Zur Geschichte Der Viehseuchen, Speziell Der Maul- Und Klauenseuche in Der Schweiz." Zürich: Universität Zürich, 1916.
- Buisman, Jan. *Duizend Jaar Weer, Wind En Water in De Lage Landen. Deel 5: 1675-1750*. edited by A. F. V. van Engelen Franeker: Van Wijnen, 2006.
- . *Duizend Jaar Weer, Wind En Water in De Lage Landen: 1575-1675*. 6 vols. Vol. 4, Franeker: Van Wijnen, 2000.
- Buisman, Jan Willem. *Tussen Vroomheid En Verlichting: Een Cultuurhistorische En - Sociologisch Onderzoek Naar Enkele Aspecten Van De Verlichting in Nederland (1755-1810)*. Zwolle: Waanders, 1992.
- Burdick, Alan. *Out of Eden: An Odyssey of Ecological Invasion*. Farrar, Straus and Giroux, 2006.
- Burroughs, W.J. "Winter Landscapes and Climatic Change." *Weather* 36 (1981): 352-57.
- Burton, Ian. *The Environment as Hazard*. edited by Robert W. Kates and Gilbert F. White New York: Oxford University Press, 1978.
- Campbell, Bruce M. S., and Cormac Ó Gráda. "Harvest Shortfalls, Grain Prices, and Famines in Preindustrial England." *The Journal of Economic History* 71, no. 04 (2011): 859-86.
- Carlton, James T. . "Molluscan Invasions in Marine and Estuarine Communities." *Malacologia* 41, no. 2 (1999): 439-54.
- Climate and History : Studies in Interdisciplinary History*. edited by Robert I. Rotberg and Theodore K. Rabb Princeton, N.J.: Princeton, N.J. : Princeton University Press, 1981.
- "Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group Ii to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change." In *IPCC AR5*, edited by C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, *et al.*, 1132. New York: Cambridge University Press, 2014.
- Crosby, Alfred W. *The Columbian Exchange : Biological and Cultural Consequences of 1492*. Westport, Conn. : Praeger, 2003.
- Cunningham, Andrew. "Medicine to Calm the Mind: Boerhaave's Medical System, and Why It Was Adopted in Edinburgh." In *The Medical Enlightenment of the Eighteenth Century*, edited by Andrew Cunningham and Roger French, 40-67. Cambridge: Cambridge University Press, 1990.
- Curth, Louise Hill. *The Care of Brute Beasts: A Social and Cultural Study of Veterinary Medicine in Early Modern England*. Leiden: Brill, 2010.
- Curtis, Daniel R. *Coping with Crisis: The Resilience and Vulnerability of Pre-Industrial Settlements*. Burlington, VT: Ashgate Publishing Limited, 2014.
- Dam, P.J.E.M van. "An Amphibious Culture. Coping with Floods in the Netherlands." In *Local Places, Global Processes: Histories of Environmental Change in Britain and Beyond*, edited by Peter Coates, David Moon and Paul Warde. Oxford: Windgather Books, (in press).

- "De Amfibische Cultuur: Een Visie Op Waternoodrampen." In *Faculteit Letteren, Inaugural Lecture*. Amsterdam: Vrije Universiteit Amsterdam, 29 October, 2010.
- "Sinking Peat Bogs: Environmental Change in Holland, 1350-1550." *Environmental History* 6, no. 1 (2001): 32-45.
- Vissen in Veenmeren : De Sluisvisserij Op Aal Tussen Haarlem En Amsterdam En De Ecologische Transformatie in Rijnland 1440-1530*. Hilversum: Uitgeverij Verloren, 1998.
- Davids, Karel. *The Rise and Decline of Dutch Technological Leadership, Volume 2: Technology, Economy and Culture in the Netherlands, 1350-1800*. 2 vols. Vol. 2, Leiden: Brill, 2008.
- The Rise and Decline of Dutch Technological Leadership: Technology, Economy and Culture in the Netherlands, 1350-1800*. 2 vols. Leiden: Brill, 2008.
- Degroot, Dagomar. "The Frigid Golden Age: Experiencing Climate Change in the Dutch Republic, 1560-1720." York University, 2014.
- Deinse, Jacobus Joannes van. "Uit Het Dagboek Van Aleida Leurink Te Losser, 1698-1754." In *Uit Het Land Van Katoen En Heide : Oudheidkundige En Folkloristische Schetsen Uit Twente*, 530-72. Enschede: van der Loeff, 1975.
- Dekker, Rudolf. *Holland in Beroering: Oproeren in De 17de En 18de Eeuw*. Baarn: Ambo, 1982.
- Deursen, A.T. van. "The Dutch Republic, 1588-1780." In *History of the Low Countries*, edited by J.C.H. Blom and E. Lamberts. New York: Berghahn Books, 2006.
- Didžiulis, Viktoras. "Invasive Alien Species Fact Sheet: Teredo Navalis." In *Nobanis Fact Sheets: Nobanis: European Network on Invasive Alien Species*.
- Dingeldein, W.H. "Tets over Mond En Klauwzeer in 1732 En Vroeger." *Tijdschrift voor diergeneeskunde* 36 (1933): 389-92.
- Doedens, Anne. *Witte De with 1599-1658: Wereldwijde Strijd Op Zee in De Gouden Eeuw*. Hilversum: Uitgeverij Verloren, 2008.
- Dorwart, Reinhold A. . "Cattle Disease (Rinderpest?): Prevention and Cure in Brandenburg, 1665-1732." *Agricultural History* 33, no. 2 (1959): 79-85.
- Dreiskämper, Petra. *Redeloos, Radeloos, Reddeloos: De Geschiedenis Van Het Rampjaar 1672*. Hilversum: Verloren, 1998.
- Duivenwoorde, Wendy van. "Doppelte Standards: Zweifache Beplankung Im Niederländischen Schiffbau Des Späten 16. Und Frühen 17. Jahrhunderts." *Skyllis: Zeitschrift für Unterwasserarchäologie* 5, no. 2 (2002): 112-22.
- Dunlop, Robert H., and David J. Williams. *Veterinary Medicine: An Illustrated History*. Mosby, 1996.
- Edmondson, Charles Howard. "Teredinidae, Ocean Travelers." *Occasional Papers of Bernice P. Bishop Museum* 23, no. 3 (1962).
- Endfield, Georgina H. , Sarah J. Davies, Isabel Fernandez Tejedo, Sarah E. Metcalfe, and Sarah L. O'Hara. "Documenting Disaster: Archival Investigations of Climate, Crisis, and Catastrophe in Colonial Mexico." In *Natural Disasters, Cultural Responses: Case Studies toward a Global Environmental History*, edited by Christof Mauch and Christian Pfister. New York: Lexington Books, 2009.
- Engelen, A. F. V. van, J. Buisman, and F. Ijnsen. "A Millennium of Weather, Winds and Water in the Low Countries." In *History and Climate*, edited by P. D. Jones, A. E. J. Ogilvie, T. D. Davies and K. R. Briffa, 101-24: Springer US, 2001.

- Engler, S, F Mauelshagen, J Werner, and J Luterbacher. "The Irish Famine of 1740–1741: Famine Vulnerability and "Climate Migration"." *Climate of the Past* 9, no. 3 (2013): 1161-79.
- Essink, Karel. *Stormvloed 1509: Geschiedenis Van De Dollard*. Stichting Verdrongen Geschiedenis, 2013.
- Faber, J.A. "Cattle Plague in the Netherlands During the Eighteenth Century." *Mededelingen van de Landbouwhogeschool te Wageningen* 62, no. 11 (1962): 1-7.
- . *Drie Eeuwen Friesland: Economische En Sociale Ontwikkelingen Van 1500 Tot 1800*. Leeuwarden: De Tille, 1973.
- Ferrières, Madeleine. *Sacred Cow, Mad Cow: A History of Food Fears*. New York: Columbia University Press, 2006.
- Formsma, W.J. *Historie Van Groningen: Stad En Land*. Groningen: Wolters-Noordhoff, 1981.
- Frank, Andre Gunder *Reorient: Global Economy in the Asian Age*. Berkeley: University of California Press, 1998.
- Fransen, Alfons. *Dijk Onder Spanning : De Ecologische, Politieke En Fianciële Geschiedenis Van De Diemerdijk Bij Amsterdam, 1591-1864*. Hilversum: Verloren, 2011.
- Frijhoff, W., and M. Spies. *Dutch Culture in a European Perspective: 1800, Blueprints for a National Community*. Palgrave Macmillan, 2004.
- Fruin, Robert, ed. *Geschiedenis Der Staatsinstellingen in Nederland Tot Den Val Der Republiek*. 's Gravenhage: M. Nijhoff, 1901.
- Fuks, Lajb. *De Zeven Provinciën in Beroering: Hoofdstukken Uit Een Jüddische Kroniek over De Jaren 1740-1752 Van Abraham Chaim Braatbard*. Amsterdam: Meulenhoff, 1960.
- Gijsbers, W., and P. A. Koolmess. "Food on Foot: Long Distance Trade in Slaughter Oxen between Denmark and the Netherlands (14th-18th Century)." *Historia Medicinae Veterinariae* 26 (2001): 115-27.
- Gijsbers, Wilhelmina Maria. "Danish Oxen in Dutch Meadows: Beef Cattle Trading and Graziery in the Netherlands between 1580 and 1750." *Facing the North Sea: West Jutland and the World; Proceeding of the Ribe Conference* (1993): 129-48.
- . *Kapitale Ossen: De Internationale Handel in Slachtvee in Noordwest-Europa (1300-1750)*. Verloren, 1999.
- Gijswijt-Hofstra, Marijke, and Florike Egmond, eds. *Of Bidden Helpt? Tegenslag En Cultuur in Europa Circa 1500-2000*. Amsterdam: Amsterdam University Press, 1997.
- Gijswit-Hofstra, Marijke, Hilary Marland, and Hans de Waardt. *Illness and Healing Alternatives in Western Europe*. New York: Routledge, 2013.
- Gilfoyle, Daniel, and Karen Brown. *Frontiers of Knowledge: Veterinary Science, Environment, and the State in South Africa, 1900-1950*. Saarbrücken: VDM Publishing, 2009.
- Goetzmann, W.N. *The Great Mirror of Folly: Finance, Culture, and the Crash of 1720*. New Haven: Yale University Press, 2013.
- Goldstone, Jack A. "East and West in the Seventeenth Century: Political Crises in Stuart England, Ottoman Turkey, and Ming China." *Comparative Studies in Society and History* 30, no. 1 (1988): 103-42.
- Gottschalk, M.K.E. *Stormvloeden En Rivieroverstromingen in Nederland*. Amsterdam: Van Gorcum, 1977.
- Grashof, Hermannus, *De Hand Gods Vitgestrekt Tot Tugtinge over Zommige Provintien Der Vereenigde Nederlanden, Bestaende in Zes Gedigten Van De Watervloed, in Kers-Nagt*,

- Van 'T Jaer 1717: T'zamen Gestelt Voor De Godvrezende* (Groningen: Johannes van Velsen, 1718).
- Hagen, Dietrich. *Die Jämmerliche Flut Von 1717: Untersuchungen Zu Einer Karte Des Frühen 18. Jahrhunderts*. Oldenburg: KomRegis, 2005.
- Hanska, Jussi. *Strategies of Sanity and Survival: Religious Responses to Natural Disasters in the Middle Ages*. Helsinki: Finnish Literature Society, 2002.
- Hartsema, David "De Kerstvloed Van 1717." In *Vroeger En Later*. Bedum: Profiel, 1989.
- Hekmeijer, Franciscus Cornelius. *Korte Geschiedenis Der Runderpest: Benevens Eene Opgave Van Al De over Deze Ziekte Handelende Geschriften, Die Van De Vroegste Tijden Tot Op Heden Zijn Uitgekomen*. Amersfoort: Jacobs en Meijers, 1845.
- Helbling, Jürg. "Coping with 'Natural' Disasters in Pre-Industrial Societies: Some Comments." *The Medieval History Journal* 10 (2006): 429-46.
- Heugten, Sjraar van. "Grazende Modellen: Aspecten Van Het Nederlandse Veestuk." In *Meesterlijk Vee: Nederlandse Veeschilders, 1600-1900*, edited by C. Boschma, J.M. de Groot, G. Jansen, J.W.M. de Jong and F. Grijzenhout. Zwolle: Uitgeverij Waanders, 1988.
- Hewitt, Kenneth. "The Idea of Calamity in a Technocratic Age." In *Interpretations of Calamity*, 3-32. London: Unwin-Hyman, 1983.
- . *Regions of Risk : A Geographical Introduction to Disasters*. Harlow, Essex: Addison Wesley Longman, 1997.
- Hobsbawm, Eric. "The General Crisis of the European Economy in the 17th Century." *Past & Present* 5 (1954): 33-53.
- Hoeksema, Robert J. "Designed for Dry Feet Flood Protection and Land Reclamation in the Netherlands." Reston, VA: American Society of Civil Engineers, 2006.
- Hollestelle, Leo. "De Zorg Voor De Zeewering Van Walcheren Ten Tijde Van De Republiek, 1574-1795." In *Duizend Jaar Walcheren: Over Gelanden, Heren En Geschoot, over Binnen- En Buiten Beheer*, edited by A. Beenhakker, 103-21. Middelburg: Koninklijk Zeeuwsch Genoots, 1996.
- Hoppe, K.N. "Teredo Navalis - the Cryptogenic Shipworm." *Invasive aquatic species of Europe: distribution, impacts, and management* (2002): 116-19.
- Hours, Henri. *La Lutte Contre Les Épidémies El L'école Vétérinaire De Lyon Au Xviii Siècle*. Presses Universitaires de France, 1957.
- Huisman, Cornelis. *Neerlands Israël: Het Natiebesef Der Traditioneel-Gereformeerden in De Achttiende Eeuw*. Dordrecht: J. P. van den Tol, 1983.
- Hünninger, Dominik. "Cattle Plague in Early Modern Germany: Environment and Economy / Knowledge and Power in a Time of Crisis." In *Elements - Continents. Approaches to Determinants of Environmental History and Their Reifications*, edited by Bernd Herrmann and Christine Dahlke, 235-40. Stuttgart: Nova Acta Leopoldina, 2009.
- . *Die Viehseuche Von 1744-52: Deutungen Und Herrschaftspraxis in Krisenzeiten*. Neumünster Wacholtz Verlag 2011.
- Huygelen, C. "The Immunization of Cattle against Rinderpest in Eighteenth-Century Europe." *Medical History* 41, no. 2 (April 1997): 182-96.
- Israel, Jonathan. *Conflicts of Empires: Spain, the Low Countries and the Struggle for World Supremacy, 1585-1713*. London: The Hambledon Press, 1997.
- . *Dutch Primacy in World Trade, 1585-1740*. New York: Oxford University Press, 1989.

- . *The Dutch Republic : Its Rise, Greatness, and Fall, 1477-1806*. New York: Oxford University Press, 1995.
- Jacob, Margaret C., and Wijnand W. Mijndhardt. *The Dutch Republic in the Eighteenth Century: Decline, Enlightenment, and Revolution*. Ithaca: Cornell University Press, 1992.
- Jakubowski-Tiessen, Manfred. "Economische En Sociale Gevolgen Van De Stormvloed in 1717." *Tijdschrift voor Waterstaatsgeschiedenis* 4, no. 41-44 (1995).
- . "'Harte Exempel Göttlicher Strafgerichte". *Kirche Und Religion in Katastrophenzeiten: Die Weihnachtsflut Von 1717*. *Niedersächsisches Jahrbuch für Landesgeschichte* 73 (2001): 119-32.
- . "Hunger, Armut, Und Ruin-Folgen Der Sturmflut Von 1717." In *Deichbau Und Sturmfluten: Beiträge Vom 2. Historiker-Treffen Des Nordfriisk Instituut* edited by Thomas Steensen, 73-82: Verlag Nordfriisk Instituut, 1992.
- . *Sturmflut 1717: Die Bewältigung Einer Naturkatastrophe in Der Frühen Neuzeit*. Oldenbourg: Oldenbourg Wissenschaftsverlag, 1992.
- Jakubowski-Tiessen, Manfred, and Harmut Lehmann, eds. *Um Himmels Willen: Religion in Katastrophenzeiten*. Göttingen: Vandenhoeck & Ruprecht, 2003.
- Janković, Vladimir. *Reading the Skies: A Cultural History of English Weather, 1650-1820*. Chicago: University of Chicago Press, 2000.
- Janku, Andrea, Gerrit Jasper Schenk, and Franz Mauelshagen. *Historical Disasters in Context: Science, Religion, and Politics*. New York: Routledge, 2012.
- Johns, Alessa, ed. *Dreadful Visitations: Confronting Natural Catastrophe in the Age of Enlightenment*. New York: Routledge, 1999.
- Johnson, Clare L., Sylvia M. Tunstall, and Edmund C. Penning-Roswell. "Floods as Catalysts for Policy Change: Historical Lessons from England and Wales." *International Journal of Water Resource Development* 21, no. 4 (2005): 561-75.
- Johnson, Sherry. "When Good Climates Go Bad: Pivot Phases, Extreme Events, and the Opportunities for Climate History." *Environmental History* 19, no. April (2014): 329-34.
- Jones, David S. "Virgin Soils Revisited." *The William and Mary Quarterly* 60, no. 4 (2003): 703-42.
- Jorink, Eric. *Reading the Book of Nature in the Dutch Golden Age, 1575-1715*. Translated by Peter Mason. Leiden: Brill, 2010.
- Juneja, Monica, and Franz Mauelshagen. "Disasters and Pre-Industrial Societies : Historiographic Trends and Comparative Perspectives." *The Medieval History Journal* 10, no. 1&2 (2007): 1-31.
- Katrin, Hauer. "Wahrnehmung, Deutung Und Bewältigung Von Starkwinden. Der Ostalpenraum Und Holland Im Vergleich (1600-1750)." PhD Dissertation. Universität Salzburg, 2008.
- Keetering, Alison McNeil. *The Dutch Arcadia: Pastoral Art and Its Audience in the Golden Age*. Allanheld and Schram, 1983.
- Kelton, Paul. *Epidemics and Enslavement: Biological Catastrophe in the Native Southeast, 1492-1715*. Lincoln: University of Nebraska Press, 2007.
- Kempe, Michael. "'Mind the Next Flood!' Memories of Natural Disasters in Northern Germany from the Sixteenth Century to the Present." *The Medieval History Journal* 10, no. 1&2 (2007): 327-54.
- . "Noah's Flood: The Genesis Story and Natural Disasters in Early Modern Times." *Environment and History* 9, no. 2 (2003): 151-71.

- Kindleberger, C.P., and R.Z. Aliber. *Manias, Panics and Crashes: A History of Financial Crises, Sixth Edition*. Palgrave Macmillan, 2011.
- Kinzelbach, Annemarie. "Infection, Contagion, and Public Health in Late Medieval and Early Modern German Imperial Towns." *Journal of the History of Medicine and Allied Sciences* 61, no. 3 (2006): 369-89.
- Kist, Nicholaas Christiaan. *Neêrland's Bededagen En Biddagsbrieven: Een Bijdrage Ter Opbouwing Der Geschiedenis Van Staat En Kerk in Nederland. De Nederlandsche Biddagsbrieven*. Leiden: Luchtmans, 1849.
- Knottnerus, Otto S. "Angst Voor De Zee: Veranderende Culturele Patronen Langs De Nederlandse En Duitse Wadden Kust (1500-1800)." In *De Republiek Tussen Zee En Vasteland: Buitenlandse Invloeden Op Cultuur, Economie En Politiek in Nederland 1580-1800*, edited by Karel Davids, Marjolein 't Hart, Henk Kleijer and Jan Luccassen, 57-81. Leuven: Garant, 1995.
- . "Dollardgeschiedenis: Mythe En Realiteit." In *Stormvloed 1509: Geschiedenis Van De Dollard*, edited by Karel Essink, 95-116. Groningen: Stichting Verdronken Geschiedenis, 2013.
- . "Malaria around the North Sea: A Survey." In *Climatic Development and History of the North Atlantic Realm: Hanse Conference Report*, edited by Gerold Wefer, Wolfgang H. Berger, Karl-Ernst Behre and Eynstein Jansen, 339-53. Berlin: Springer-Verlag, 2002.
- . "Moral Economy Behind the Dikes Class Relations Along the Frisian and German North Sea Coast During the Early Modern Age." *Tijdschrift voor Sociale Geschiedenis* 18, no. 2 (1992): 333-52.
- Koene, B. *Goede Luiden En Gemene Onderzaten: Assendelft Vanaf Zijn Ontstaan Tot De Nadagen Van De Gouden Eeuw*. Hilversum: Verloren, 2010.
- Koman, Ruben A. *Bèèh, Groot Dordts Volksverhalenboek / Druk 1*. Bedum: Profiel Uitgeverij, 2005.
- Koolmess, P. A. "Epizootic Diseases in the Netherlands, 1713-2002: Veterinary Science, Agricultural Policy, and Public Response." In *Healing the Herds: Disease, Livestock Economies, and the Globalization of Veterinary Medicine*, edited by Karen Brown and Daniel Gilfoyle, 19-41. Athens, OH: Ohio University Press, 2010.
- Koslowski, Gerhard, and Rüdiger Glaser. "Variations in Reconstructed Ice Winter Severity in the Western Baltic from 1501 to 1995, and Their Implications for the North Atlantic Oscillation." *Climatic Change* 41, no. 2 (1999): 175-91.
- Kossmann, E.H. "The Dutch Republic in the Eighteenth Century." In *The Dutch Republic in the Eighteenth Century: Decline, Enlightenment, and Revolution*, edited by Margaret C. Jacob and Wijnand W. Mijnhardt, 19-31. Ithaca: Cornell University Press, 1992.
- Kraker de, Adriaan M. J. "Historical Climatology, 1950-2006." *Belgeo* 3 (2006): 307-38.
- . "Reconstruction of Storm Frequency in the North Sea Area of the Preindustrial Period, 1400-1625 and the Connection with Reconstructed Time Series of Temperatures." *History of Meteorology* 2 (2005): 51-69.
- Kremer, Peter. "Wenn Der „Blanke Hans“ Zur Sintflut Wird." In *Mensch Und Meer, Küste Und Marsch*, edited by M. Fansa, 145-67. Oldenburg: Landesmuseums für Natur und Mensch Oldenburg, 2006.
- Kronk, Gary W. *Cometography: Volume 1, Ancient-1799: A Catalog of Comets*. Cambridge: Cambridge University Press, 1999.
- Lamb, H. H. *Climate: Present, Past, and Future, Vol. 2*. New York: Barnes and Noble, 1977.

- Lamb, H. H., and Knud Frydendahl. *Historic Storms of the North Sea, British Isles and Northwest Europe*. New York: Cambridge University Press, 1991.
- Lamy, Elsa, Sofia van Harten, Elvira Sales-Baptista, Maria Manuela Mendes Guerra, and André Martinho de Almeida. "Factors Influencing Livestock Productivity." In *Environmental Stress and Amelioration in Livestock Production*, edited by V. Sejian, S.M.K. Naqvi, T. Ezeji, J. Lakritz and R. Lal, 19-52. New York: Springer, 2012.
- Leenders, Karel. "'Die Inundatie Ende Inbreck Van Onsen Grooten Waert': De Verdrinking Van De Grote Waard." In *'Nijet Dan Water Ende Wolcken': De Onderzoekscommissie Naar De Aanwassen in De Verdrongen Waard (1521-1523)*, edited by Valentine Wikaart, 65-71. Tilburg: Stichting Zuidelijk Historisch Contact, 2009.
- Leendertz, P., J. Anspach, J.F. van Someren, and G. Fuldauer. *De Navorscher: Een Middel Tot Gedachtenwisseling En Letterkundig Verkeer Tuschen Allen, Die Iets Weten, Iets Te Vragen Hebben of Iets Kunnen Oplossen*. 1862.
- Leeuwen, M.H.D. van, and J. van Gerwen. *Zoeken Naar Zekerheid: Risico's, Preventie, Verzekeringen En Andere Zekerheidsregelingen in Nederland, 1500-2000*. Verbond van Verzekeraars, 2000.
- Lindemann, Mary. *Medicine and Society in Early Modern Europe*. Cambridge: Cambridge University Press, 2010.
- Lottum, Jelle van. *Across the North Sea: The Impact of the Dutch Republic on International Labour Migration, C.1550-1850*. Amsterdam: Aksant Academic Publishers, 2007.
- Luterbacher, Jürg, Daniel Dietrich, Elena Xoplaki, Martin Grosjean, and Heinz Wanner. "European Seasonal and Annual Temperature Variability, Trends, and Extremes since 1500." *Science* 303, no. 5663 (2004): 1499-503.
- Margócsy, Dániel. *Commercial Visions: Science, Trade, and Visual Culture in the Dutch Golden Age*. Chicago: University of Chicago Press, 2014.
- Mauch, Christof, and Christian Pfister, eds. *Natural Disasters, Cultural Responses : Case Studies toward a Global Environmental History*. Lanham, MD: Lexington Books, 2009.
- Mauelshagen, Franz. "Flood Disasters and Political Culture at the German North Sea Coast: A Long-Term Historical Perspective." *Historical Social Research / Historische Sozialforschung* 32, no. 3 (121) (2007): 133-44.
- . "Gotteszorn Und Meereswüthen. Deutungen Von Sturmfluten Vom 16. Bis 19. Jahrhundert." *Naturkatastrophen. Beiträge Zu Ihrer Deutung, Wahrnehmung Und Darstellung in Text Und Bild Von Der Antike Bis Ins 20. Jahrhundert*, edited by Dieter Groh, Michael Kempe and Franz Mauelshagen, 101-18. Tübingen: Gunter Narr Verlag, 2003.
- McNeill, William. *Plagues and Peoples*. New York: Knopf Doubleday Publishing Group, 2010.
- Meer, Theodorus Albertus Maria van der. "Sodoms Zaad in Nederland: Het Ontstaan Van Homoseksualiteit in De Vroegmoderne Tijd." PhD Dissertation. Vrije Universiteit Amsterdam, 1995.
- Mijnhardt, W. W. "Tot Heil Van 'T Menschdom : Culturele Genootschappen in Nederland, 1750-1815." Rodopi, 1987.
- Mikhail, Alan. "Unleashing the Beast: Animals, Energy, and the Economy of Labor in Ottoman Egypt." *The American Historical Review* 118, no. 2 (2013): 317-48.
- Miller, Genevieve. *The Adoption of Inoculation for Smallpox in England and France*. Philadelphia: University of Pennsylvania Press, 1957.

- Miller, Gifford H., Áslaug Geirsdóttir, Yafang Zhong, Darren J. Larsen, Bette L. Otto-Bliesner, Marika M. Holland, David A. Bailey, et al. "Abrupt Onset of the Little Ice Age Triggered by Volcanism and Sustained by Sea-Ice/Ocean Feedbacks." *Geophysical Research Letters* 39, no. 2 (2012): L02708.
- Moelker, H.P. "De Diemerdijk: De Gevolgen Van Paalwormvraat in De 18e Eeuw." *Tijdschrift voor Waterstaatsgeschiedenis* 6 (1997): 46-52.
- Mouthaan, J. *'Het Knaegen Der Wormen Aen De Paelen Der Nederlandze Zeedyken': Reacties Op De Teredo Navalis in De Nederlandse Republiek Vanuit Cultuurhistorisch Perspectief, 1731-1735*. Zoetermeer: Free Musketeers, 2010.
- Mouthaan, José. "The Appearance of a Strange Kind of Sea Worm at the Dutch Coast, 1731." *Dutch Crossing: A Journal of Low Countries Studies* 27, no. 1 (2003): 3-22.
- Munt, Annette. "The Impact of the Rampjaar on Dutch Golden Age Culture." *Dutch Crossing: A Journal of Low Countries Studies* 21, no. 1 (1997): 3-51.
- Nair, N. Balakrishnan. "Ecology of Marine Fouling and Wood-Boring Organisms of Western Norway." *Sarsia* 8, no. 1 (1962/11/20 1962): 1-88.
- Neuberger, Hans. "Climate in Art." *Weather* 25 (1970): 46-56.
- Neukom, Raphael, Joelle Gergis, David J. Karoly, Heinz Wanner, Mark Curran, Julie Elbert, Fidel Gonzalez-Rouco, et al. "Inter-Hemispheric Temperature Variability over the Past Millennium." *Nature Climate Change* 4, no. 5 (2014): 362-67.
- Newfield, Timothy. "A Cattle Panzootic in Early Fourteenth-Century Europe." *Agricultural History Review* 57, no. 2 (2010): 155-90.
- Nijs, Thimo de, and Eelco Beukers. *Geschiedenis Van Holland*. Hilversum: Verloren, 2002.
- Noordegraaf, Leo. "Of Bidden Helpt? Bededagen Als Reactie Op Rampen in De Republiek." In *Of Bidden Helpt? Tegenslag En Cultuur in Europa Circa 1500-2000*, edited by Marijke Gijswijt-Hofstra and Florike Egmond. Amsterdam: Amsterdam University Press, 1997.
- Noordlandt, Dirck Gerritsz. *Kort Verhael Van De Ongemacken Die Het Noorder-Landt over-Gekomen Zijn Door Een Water-Vloedt, Tusschen Den 4 En 5 Nov. 1675*. Hoorn: Stoffel Jasz. Kortinhg, 1677.
- November, Valérie, Marion Penelas, and Pascal Viot. "When Flood Risk Transforms a Territory: The Lully Effect." *Geography* 94, no. 3 (2009): 189-97.
- Nowosadtko, Jutta. "Milzbrand, Tollwut, Wölfe, Spatzen Und Maikäfer. Die Gesellschaftliche Verteilung Von Zuständigkeiten Bei Der Bekämpfung Von Viehseuchen Und Schädlichen Tieren in Der Frühen Neuzeit." In *Beten, Impfen, Sammeln: Zur Viehseuchen- Und Schädlingsbekämpfung in Der Frühen Neuzeit*, edited by Dominik Hünninger Katharina Engelken, Steffi Windelen. Göttingen: Universitätsverlag Göttingen, 2007.
- Nugent, Thomas. *The Grand Tour*. London: S. Birt, D. Browne, A. Millar and G. Hawkins, 1749.
- Offringa, Cornelis. "Ars Veterinaria: Ambacht, Professie, Beroep: Sociologische Theorie En Historische Praktijk." *Tijdschrift voor Geschiedenis* 96 (1983): 407-32.
- . *Van Gildestein Naar Uithof: 150 Jaar Diergenesskundig Onderwijs in Utrecht. 1. 'S Rijksveeartsenisschool (1821 - 1918); Veeartsenijkundige Hoogeschool (1918 - 1925)*. Utrecht: Rijksuniv. te Utrecht, Fac. der dieregeneeskunde, 1971.
- Oliver-Smith, Anthony. "Theorizing Disasters: Nature, Power, and Culture." In *Catastrophe & Culture: The Anthropology of Disaster*, edited by Susanna M. Hoffman and Anthony Oliver-Smith, 23-47. Oxford: James Currey, 2002.

- Paalvast, Peter. "Ecological Studies in a Man-Made Estuarine Environment, the Port of Rotterdam." PhD Dissertation Radboud Universiteit Nijmegen, 2014.
- Paimans, W.J. "De Veeartsenijkunde in Nederland Voor De Stichting Der Veeartsenijschool De Utrecht." In *Een Eeuw Veeartsenijkundig Onderwijs. 'S Rijks-Veeartsenijschool, Veeartsenijkundige Hoogeschool, 1821-1921*. Utrecht: Senaat der Veeartsenijkundig Hoogeschool te Utrecht, 1921.
- Parker, Geoffrey. *Global Crisis: War, Climate Change and Catastrophe in the Seventeenth Century*. New Haven: Yale University Press, 2013.
- Parker, Geoffrey, and Lesley M. Smith, eds. *The General Crisis of the Seventeenth Century*. Boston: Routledge & Kegan Paul, 1978.
- Parthesius, Robert. *Dutch Ships in Tropical Waters : The Development of the Dutch East India Company (Voc) Shipping Network in Asia 1595-1660*. Amsterdamse Gouden Eeuw Reeks. Amsterdam: Amsterdam University Press, 2010.
- Pfister, Christian. "Learning from Nature Induced Disasters." In *Natural Disasters, Cultural Responses: Case Studies toward a Global Environmental History*, edited by Christof Mauch and Christian Pfister, 17-40. New York: Lexington Books, 2009.
- . "The Monster Swallows You: Disaster Memory and Risk Culture in Western Europe, 1500-2000." *Rachel Carson Center Perspectives* 1 (2011): 1-23.
- Pfister, Christian, and Rudolf Brázdil. "Social Vulnerability to Climate in the "Little Ice Age": An Example from Central Europe in the Early 1770s." *Climate of the Past* 2, no. 2 (2006): 115.
- Pieters, Harm. "Metamorfose: Van Hout Naar Steen." *Historisch Tijdschrift Holland* 42, no. 3 (2010): 270-74.
- Porter, Roy. "Laymen, Doctors, and Medical Knowledge in the Eighteenth Century: The Evidence of the Gentleman's Magazine." In *Patients and Practitioners: Lay Perceptions of Medicine in Pre-Industrial Society*, edited by Roy Porter, 283-314. Cambridge: Cambridge University Press, 1985.
- . *Patients and Practitioners: Lay Perceptions of Medicine in Pre-Industrial Society*. Cambridge: Cambridge University Press, 2003.
- Post, John D. "Climatic Variability and the European Mortality Wave of the Early 1740s." *Journal of Interdisciplinary History* (1984): 1-30.
- . *Food Shortage, Climatic Variability, and Epidemic Disease in Preindustrial Europe: The Mortality Peak in the Early 1740s*. Ithaca: Cornell University Press, 1985.
- Poulsen, Bo. *Dutch Herring: An Environmental History, C. 1600-1860*. Amsterdam: Aksant, 2008.
- Price, J.L. *Dutch Culture in the Golden Age*. London: Reaktion Books, 2012.
- Priester, Peter R. *Geschiedenis Van De Zeeuwse Landbouw Circa 1600-1910*. Utrecht: HES, 1998.
- Rabb, Theodor K. *The Struggle for Stability in Early Modern Europe*. Oxford: Oxford University Press, 1975.
- Reinders, Michel. "Burghers, Orangists and 'Good Government': Popular Political Opposition During the 'Year of Disaster' 1672 in Dutch Pamphlets." *Seventeenth Century* 23, no. 2 (2008): 315-46.
- . *Gedrukte Chaos: Populisme En Moord in Het Rampjaar 1672*. Amsterdam: Balans, 2010.

- Reinert, Erik S. "Emulating Success: Contemporary Views of the Dutch Economy before 1800." In *The Political Economy of the Dutch Republic*, edited by Oscar Gelderblom, 19-40. Burlington, VT: Ashgate Publishing, 2013.
- Rieken, Bernd. "*Nordsee Ist Mordsee*": *Sturmfluten Und Ihre Bedeutung Für Die Mentalitätsgeschichte Der Friesen*. Münster: Waxmann Verlag, 2005.
- Riley, J.C. "The Dutch Economy after 1650: Decline or Growth?". *Journal of European Economic History* 13 (1984): 521-69.
- Robinson, Peter J. . "Ice and Snow in Paintings of Little Ice Age Winters." *Weather* 60, no. 2 (2005): 37-41.
- Roessingh, H.K. "Landbouw in De Noordelijke Nederlanden, 1650-1815." *Algemene Geschiedenis der Nederlanden* 8 (1979): 16-72; 451-53.
- Rohr, Christian. "Writing a Catastrophe. Describing and Constructing Disaster Perception in Narrative Sources from the Late Middle Ages." *Historical Social Research / Historische Sozialforschung* 32, no. 3 (121) (2007): 88-102.
- Rommes, Ronald. "'Geen Vrolyk Geloei Der Melkzwaare Koeijen': Runderpest in Utrecht in De Achttiende Eeuw." *Jaarboek Oud Utrecht* (2001): 88-136.
- . "Twee Eeuwen Runderpest in Nederland (1700-1900)." *Argos: bulletin van het Veterinair Historische Genootschap* 31 (2004): 33-40.
- Rooden, Peter van. "Dissenters En Bededagen. Civil Religion Ten Tijden Van De Republiek." *BMGN: Low Countries Historical Review* 107, no. 4 (1992): 703-12.
- Ruddiman, William F. "The Anthropogenic Greenhouse Era Began Thousands of Years Ago." *Climatic Change* 61, no. 3 (2003/12/01 2003): 261-93.
- Scarborough, John. *Medical and Biological Terminologies: Classical Origins*. Norman: University of Oklahoma Press, 1992.
- Schama, Simon. *The Embarrassment of Riches : An Interpretation of Dutch Culture in the Golden Age*. New York: Knopf, 1987.
- Schenckel, H., L. Smids, and T. Brongersma. *Kort En Bondige Beschrijvinge Van De Schrickelijcke Water-Vloedt Den 13. Novemb. 1686. Over De Provincie Van Stadt En Lande Ontstaen, Behelsende Een Waerachtigh Verhael Van ... Voorvallen ... Alles Door Eygene Ondervindinge Ofte ... Oor- En Oogh-Getuygen Bevestight*. Groningen: by Carel Pieman, 1687.
- Schenk, Gerrit Jasper. "Common Grounds in Early Modern Disaster Experiences? Some Remarks on New Trends in Historical Disaster Research as Part of Environmental History and Climate History." In *An Environmental History of the Early Modern Period: Experiments and Perspectives*, edited by M. Knoll and R. Reith, 11-18. Berlin: Lit Verlag, 2014.
- Schilstra, Johannes Jouke. *In De Ban Van De Dijk: De Westfriese Omringdijk*. Hoorn: West-Friesland, 1982.
- Schlimme, J.F.C. *Het Dagboek Van Jacob Pos*. Historische Kring, 1992.
- Schöffers, Ivo "Did Holland's Golden Age Coincide with a Period of Crisis?". In *The General Crisis of the Seventeenth Century*, edited by Geoffrey and Lesley M. Smith Parker, 82-109. London: Routledge and Kegan Paul, 1985.
- Schoorl, H. *Zeshonderd Jaar Water En Land: Bijdrage Tot De Historische Geo- En Hydrografie Van De Kop Van Noord-Holland in De Periode ± 1150-1750*. Wolters-Noordhoff, 1973.
- Singer, Merrill. *Introduction to Syndemics: A Critical Systems Approach to Public and Community Health*. San Francisco: Wiley, 2009.

- Slicher van Bath, B.H. *Een Samenleving Onder Spanning: Geschiedenis Van Het Platteland in Overijssel*. Utrecht: HES Publishers, 1957.
- Smith, Pamela H., and Paula Findlen. *Merchants and Marvels: Commerce Science and Art in Early Modern Europe: Commerce, Science, and Art in Early Modern Europe*. New York: Taylor & Francis, 2013.
- Smithcors, J.F. *Evolution of the Veterinary Art: A Narrative Account to 1850*. Kansas City, MO: Veterinary Medicine Publishing Co., 1957.
- Spahr van der Hoek, J.J. *Geschiedenis Van De Friese Landbouw*. Vol. 1, Drachten: Friesche Maatschappij van Landbouw, 1952.
- Spanninga, Hotso. *Gulden Vrijheid?: Politieke Cultuur En Staatsvorming in Friesland, 1600-1640*. Hilversum: Verloren, 2012.
- Speeleveldt, Theodorus. *Brieven over Het Eiland Walcheren*. The Hague: Immerzeel en comp., 1808.
- Spinage, Clive A. *Cattle Plague: A History*. New York: Kluwer Academic/Plenum Publishers, 2003.
- Stapelbroek, Koen. "Dutch Decline as a European Phenomenon." *History of European Ideas* 36, no. 2 (2010): 139-52.
- Steinberg, Theodore. *Acts of God : The Unnatural History of Natural Disaster in America*. New York: Oxford University Press, 2006.
- Stone, Deborah A. "Causal Stories and the Formation of Policy Agendas." *Political Science Quarterly* 104, no. 2 (1989): 281-300.
- Stühling, Carsten. *Der Seuche Begegnen: Deutung Und Bewältigung Von Rinderseuchen Im Kurfürstentum Bayern Des 18. Jahrhunderts*. Lang, 2011.
- . "Managing Epizootic Diseases in 18th Century Bavaria." In *Economic and Biological Interactions in Pre-Industrial Europe from the 13th to the 18th Century, 1000-08*. Florence: Firenze University Press, 2010.
- Suchtelen, Ariane van, ed. *Holland Frozen in Time: The Dutch Winter Landscape in the Golden Age*. Zwolle: Waanders, 2001.
- Sundberg, Adam. "Claiming the Past: History, Memory, and Innovation Following the Christmas Flood of 1717." *Environmental History* (forthcoming, April 2015).
- Swabe, Joana. *Animals, Disease and Human Society: Human-Animal Relations and the Rise of Veterinary Medicine*. Taylor & Francis, 2002.
- Swan, Claudia. *Art, Science, and Witchcraft in Early Modern Holland: Jacques De Gheyn II (1565-1629)*. Cambridge: Cambridge University Press, 2005.
- Taylor, William P. *Rinderpest and Peste Des Petits Ruminants: Virus Plagues of Large and Small Ruminants*. Elsevier Science, 2005.
- TeBrake, William H. *Medieval Frontier : Culture and Ecology in Rijnland*. College Station : Texas A&M University Press, 1985.
- Thiers, Ottie. *'T Putje Van Heiloo: Bedevaarten Naar O.L. Vrouw Ter Nood*. Hilversum: Verloren, 2005.
- Tielhof, Milja van. "Forced Solidarity: Maintenance of Coastal Defences Along the North Sea Coast in the Early Modern Period." *Environment and History* (forthcoming).
- Tol, Richard, and Andreas Langen. "A Concise History of Dutch River Floods." *Climatic Change* 46, no. 3 (2000): 357-69.
- Treuherz, Julian. "The Cat and the Cradle." *Journal of the Warburg and Courtauld Institutes* 46 (1983): 240-42.

- Trevor-Roper, Hugh R. "The General Crisis of the 17th Century." *Past and Present* (1959): 31-64.
- Utrecht Veeartsenijkundige Hoogeschool. *Een Eeuw Veeartsenijkundig Onderwijs: 'S Rijks-Veeartsenijsschool, Veeartsenijkundige Hoogeschool, 1821-1921*. Utrecht: J. van Boekhoven, 1921.
- Vanhaute, Eric, and Thijs Lambrecht. "Famine, Exchange Networks and the Village Community. A Comparative Analysis of the Subsistence Crises of the 1740s and the 1840s in Flanders." *Continuity and Change* 26, no. 02 (2011): 155-86.
- Veen, Tjaart van, W. Schillhorn. "One Medicine: The Dynamic Relationship between Animal and Human Medicine in History and at Present." *Agriculture and Human Values* 15 (1998): 115-20.
- Ven, G.P van de. *Leefbaar Laagland: Geschiedenis Van De Waterbeheersing En Landaanwinning in Nederland*. International Commission on Irrigation and Drainage. Nederlands Nationaal Comité. Utrecht: Uitgeverij Matrijs, 2003.
- . *Man-Made Lowlands: History of Water Management and Land Reclamation in the Netherlands*. Utrecht: Matrijs, 2004. (English translation)
- Vleer, W.T. 'Sterf Sodomieten!': Rudolf De Mepsche, De Homofielenvervolgung, Het Faanse Zedenproces En De Massamoord Te Zuidhorn. Norg: Veja, 1972.
- Vries, Jan de. "The Crisis of the Seventeenth Century: The Little Ice Age and the Mystery of the "Great Divergence"." *Journal of Interdisciplinary History* 44, no. 3 (2014): 369-77.
- . "The Economic Crisis of the Seventeenth Century after Fifty Years." *Journal of Interdisciplinary History* 40, no. 2 (2009): 151-94.
- . "Measuring the Impact of Climate on History: The Search for Appropriate Methodologies." *The Journal of Interdisciplinary History* 10, no. 4 (1980): 599-630.
- Vries, Jan de, and Ad van der Woude. *The First Modern Economy : Success, Failure, and Perseverance of the Dutch Economy, 1500-1815*. New York: Cambridge University Press, 1997.
- Vries, Johan de. *De Economische Achteruitgang Der Republiek in De Achttiende Eeuw*. Leiden: Stenfert Kroese, 1968.
- Waal, Henri. *Drie Eeuwen Vaderlandsche Geschied-Uitbeelding, 1500-1800: Een Iconologische Studie*. M. Nijhoff, 1952.
- Waardt, Hans de. "Breaking the Boundaries: Irregular Healers in Eighteenth-Century Holland ". Chap. 7 In *Illness and Healing Alternatives in Western Europe* 141-60. London: Routledge, 1997.
- Waller, Richard, and Kathy Homewood. "Elders and Experts: Contesting Veterinary Knowledge in a Pastoral Community." In *Western Medicine as Contested Knowledge*, edited by Andrew Cunningham and Bridie Andrews, 69-93. Manchester: Manchester University Press, 1997.
- Walsham, A. *Providence in Early Modern England*. Oxford: Oxford University Press, 1999.
- Walsmit, E. *Spiegel Van De Zuiderzee: Geschiedenis En Cartobibliografie Van De Zuiderzee En Het Hollands Waddengebied*. Utrecht: HES & De Graaf, 2009.
- Wanamaker, Alan D., Paul G. Butler, James D. Scourse, Jan Heinemeier, Jón Eiríksson, Karen Luise Knudsen, and Christopher A. Richardson. "Surface Changes in the North Atlantic Meridional Overturning Circulation During the Last Millennium." *Nat Commun* 3 (2012): 899.

- Water, J. van de, C.W. Moorrees, and P.J. Vermeulen. *Groot Plakkaatboek 'Slands Van Utrecht: Aangevuld En Vervolgd Tot Het Jaar 1810*. Kemink en Zoon, 1856.
- Weerden, Jan Stoffer van. "De Kerstvloed Van 1717." In *Marne Memories*. Leens: Vereniging Kring de Marne, 2000.
- Wheeler, D., R. Garcia-Herrera, C. Wilkinson, and C. Ward. "Atmospheric Circulation and Storminess Derived from Royal Navy Logbooks: 1685 to 1750." *An Interdisciplinary, International Journal Devoted to the Description, Causes and Implications of Climatic Change* 101, no. 1 (2010): 257-80.
- Wheelock Jr., Arthur K. . "Accidents and Disasters." In *Time and Transformation in Seventeenth-Century Dutch Art*, edited by Susan Donahue Kuretsky, 73-82. Poughkeepsie, NY: Vassar College, 2005.
- White, Sam. "The Real Little Ice Age." *Journal of Interdisciplinary History* 44, no. 3 (2014): 327-52.
- Wilkinson, Lise. *Animals and Disease: An Introduction to the History of Comparative Medicine*. Cambridge: Cambridge University Press, 1992.
- "Rinderpest and Mainstream Infectious Disease Concepts in the Eighteenth-Century." *Medical History* 28 (1984): 129-50.
- Woods Hole Oceanographic Institution. "The History of the Prevention of Fouling." In *Marine Fouling and Its Prevention*. Annapolis, Maryland: United States Naval Institute, 1952.
- The Works of Virgil Translated into English Prose*. London: Geo B. Whittaker et al., 1826.
- Worster, Donald. "Transformations of the Earth: Toward an Agroecological Perspective in History." *Journal of American History* 76, no. 4 (1990): 1087.
- Woude, A.M. van der. *Het Noorderkwartier: Een Regionaal Historisch Onderzoek in De Demografische En Economische Geschiedenis Van Westelijk Nederland Van De Late Middeleeuwen Tot Het Begin Van De Negentiende Eeuw*. Utrecht: H&S Uitgevers, 1983.
- Zanden, Jan Luiten van. "De Economie Van Holland in De Periode 1650-1805: Groei of Achteruitgang? Een Overzicht Van Bronnen, Problemen En Resultaten." *BMGN: Low Countries Historical Review* 102, no. 4 (1987): 562-609.
- The Rise and Decline of Holland's Economy: Merchant Capitalism and the Labour Market*. Manchester: Manchester University Press, 1993.
- Zeischka, Siger. *Minerva in De Polder: Waterstaat En Techniek in Het Hoogheemraadschap Van Rijnland 1500-1865*. Hilversum: Uitgeverij Verloren, 2008.
- Zeller, Rosemarie. "Reading Images of Natural Disaster in Printed Media of Early Modern Europe." In *Disaster as Image: Iconographies and Media Strategies across Europe and Asia*, edited by Monica Juneja and Gerrit Jasper Schenk, 55-70. Regensburg: Schnell & Steiner, 2014.

Appendix I. List of Disasters, 1672-1764

| Year(s) | Nature-induced Disaster | Extent | Military Involvement |
|---------|--------------------------------|-------------------|----------------------|
| 1672 | Rampjaar/Wartime Inundation | National/Regional | Franco-Dutch War |
| 1673 | | | |
| 1674 | Storm | National | |
| 1675 | Coastal Flood | Regional | |
| 1676 | Drought | National | |
| 1677 | Fire | Local | |
| 1677 | Fire | Local | |
| 1677 | River flood | Regional | |
| 1677 | Storm | Regional | |
| 1678 | | | |
| 1679 | | | |
| 1680 | Fire | Local | |
| 1681 | Drought | National | |
| 1682 | River flood | National | |
| 1682 | Coastal Flood | Regional | |
| 1682 | Cattle Plague (Hoof and Mouth) | Transnational | |
| 1683 | Storm | | |
| 1684 | Fire | Local | |
| 1684 | Fire | Local | |
| 1685 | Fire | Local | |
| 1686 | Coastal Flood | Regional | |
| 1687 | Fire | Local | |
| 1687 | Fire | Local | |
| 1687 | Fire | Local | |
| 1688 | | | Nine Years War |
| 1689 | | | |
| 1690 | Storm | Regional | |
| 1691 | Drought | National | |
| 1692 | River flood | Regional | |
| 1693 | | | |
| 1694 | Coastal Flood | Regional | |
| 1695 | Fire | Local | |
| 1696 | Fire | Local | |
| 1697 | | | |
| 1698 | Fire | Local | |
| 1698 | River flood | Local | |
| 1699 | Fire | Local | |
| 1699 | River flood | Local | |

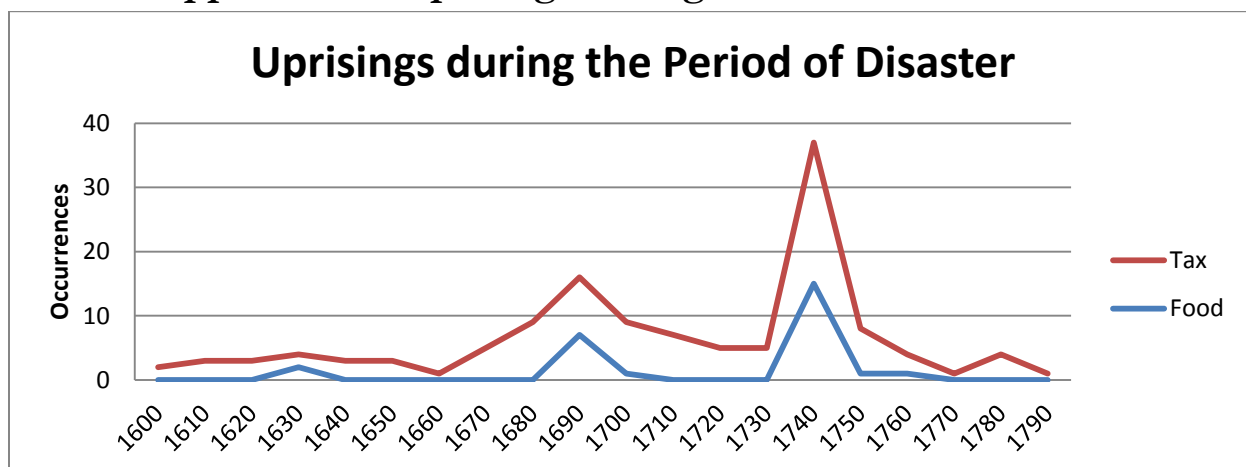
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|------|---------------|---------------|---------------------------|
| 1700 | | | |
| 1701 | Fire | Local | War of Spanish Succession |
| 1701 | Fire | Local | |
| 1701 | Coastal Flood | Regional | |
| 1702 | Coastal Flood | Regional | |
| 1702 | Fire | Regional | |
| 1702 | Fire | Local | |
| 1703 | Storm | Transnational | |
| 1703 | Fire | Local | |
| 1704 | River floods | Local | |
| 1705 | Fire | Local | |
| 1706 | Fire | Local | |
| 1707 | | | |
| 1708 | Fire | Local | |
| 1708 | Frost | | |
| 1709 | Frost | Transnational | |
| 1709 | River floods | Transnational | |
| 1710 | | | |
| 1711 | River flood | Regional | |
| 1712 | Cattle Plague | Transnational | |
| 1713 | Cattle Plague | Transnational | |
| 1714 | Coastal Flood | Regional | |
| 1714 | Cattle Plague | Transnational | |
| 1715 | Cattle Plague | Transnational | |
| 1715 | Coastal Flood | Regional | |
| 1716 | Cattle Plague | Transnational | |
| 1716 | Frost | National | |
| 1717 | Cattle Plague | Transnational | |
| 1717 | Fire | Local | |
| 1717 | Coastal Flood | Transnational | |
| 1718 | Cattle Plague | Transnational | |
| 1719 | Coastal Flood | Regional | War of Quadruple Alliance |
| 1719 | Cattle Plague | Transnational | |
| 1720 | Cattle Plague | Transnational | |
| 1720 | Storm | Regional | |
| 1721 | Storm | Local | |
| 1722 | | | |
| 1723 | Fire | Local | |

| | | | |
|------|--------------------------------|---------------|----------------------------|
| 1723 | Fire | Local | |
| 1724 | | | |
| 1725 | Fire | Local | |
| 1726 | River flood | Transnational | |
| 1727 | Fire | Local | |
| 1728 | | | |
| 1729 | River Flood | Local | |
| 1729 | Fire | Local | |
| 1730 | Drought | Transnational | |
| 1730 | Shipworm | National | |
| 1731 | Shipworm | National | |
| 1731 | Drought | Transnational | |
| 1732 | Shipworm | National | |
| 1732 | Cattle Plague (Hoof and Mouth) | Transnational | |
| 1732 | Fire | Drimmelen | |
| 1732 | Drought | Transnational | |
| 1733 | Shipworm | National | |
| 1733 | Drought | Transnational | |
| 1734 | Shipworm | National | |
| 1735 | Shipworm | National | |
| 1735 | Storm | Local | |
| 1736 | | | |
| 1737 | Fire | Local | |
| 1738 | | | |
| 1739 | Frost | Transnational | |
| 1740 | Frost | Transnational | War of Austrian Succession |
| 1740 | River Flood | Regional | |
| 1741 | River flood | Regional | |
| 1741 | Fire | Local | |
| 1741 | Drought | Transnational | |
| 1741 | Storm | Regional | |
| 1742 | Drought | Transnational | |
| 1742 | Mouse Plague | Regional | |
| 1743 | Drought | Transnational | |
| 1743 | River flood | Regional | |
| 1743 | Fire | Local | |
| 1744 | River Flood | Regional | |
| 1744 | Drought | Transnational | |
| 1744 | Cattle Plague | Transnational | |

| | | | |
|------|---------------|---------------|--|
| 1745 | Cattle Plague | Transnational | |
| 1746 | Cattle Plague | Transnational | |
| 1746 | Fire | Local | |
| 1746 | Fire | Local | |
| 1747 | Cattle Plague | Transnational | |
| 1747 | Storm | Regional | |
| 1747 | River flood | Regional | |
| 1747 | Drought | Transnational | |
| 1748 | Drought | Transnational | |
| 1748 | Cattle Plague | Transnational | |
| 1749 | Cattle Plague | Transnational | |
| 1749 | Drought | Transnational | |
| 1749 | Fire | Local | |
| 1750 | Drought | Transnational | |
| 1750 | Cattle Plague | Transnational | |
| 1750 | Hail | Regional | |
| 1750 | Fire | Local | |
| 1750 | Fire | Local | |
| 1750 | Fire | Local | |
| 1751 | Cattle Plague | Regional | |
| 1751 | River Flood | Regional | |
| 1752 | Cattle Plague | Transnational | |
| 1753 | Cattle Plague | Transnational | |
| 1754 | Cattle Plague | Transnational | |
| 1755 | Cattle Plague | Transnational | |
| 1756 | Cattle Plague | Transnational | |
| 1757 | River Flood | Regional | |
| 1757 | Cattle Plague | Transnational | |
| 1758 | Fire | Local | |
| 1758 | Cattle Plague | Transnational | |
| 1759 | Fire | Local | |
| 1759 | Cattle Plague | Transnational | |
| 1760 | Fire | Local | |
| 1760 | Fire | Local | |
| 1760 | Cattle Plague | Transnational | |
| 1761 | Cattle Plague | Transnational | |
| 1762 | Cattle Plague | Transnational | |
| 1763 | Cattle Plague | Transnational | |
| 1764 | Cattle Plague | Transnational | |

Sources: Jan Buisman, *Duizend Jaar Weer, Wind, en Water* Deel 5: 1675-1750 (Franeker: Van Wijnen, 2006); J. Faber, *Drie Eeuwen Friesland, economische en sociale ontwikkelingen van 1500 tot 1800* (Leeuwarden: De Tille, 1973), 463-464; Ronald Rommes, "'Geen vrolyk geloei der melkzwaare koeijen': Runderpest in Utrecht in de Achttiende Eeuw," *Jaarboek Oud Utrecht*, 3; W. Rosema, *Watersnood en storm in Nederland 1500-2000* (2002) <http://rampenpublicaties.nl/>

Appendix II. Uprisings during the Period of Disaster



Source: Rudolf Dekker, *Holland in Beroering: Oproeren in De 17de En 18de Eeuw*. Baarn: Ambo, 1982.

| Decade | Food | Tax |
|--------|------|-----|
| 1600 | 0 | 2 |
| 1610 | 0 | 3 |
| 1620 | 0 | 3 |
| 1630 | 2 | 2 |
| 1640 | 0 | 3 |
| 1650 | 0 | 3 |
| 1660 | 0 | 1 |
| 1670 | 0 | 5 |
| 1680 | 0 | 9 |
| 1690 | 7 | 9 |
| 1700 | 1 | 8 |
| 1710 | 0 | 7 |
| 1720 | 0 | 5 |
| 1730 | 0 | 5 |
| 1740 | 15 | 22 |
| 1750 | 1 | 7 |
| 1760 | 1 | 3 |
| 1770 | 0 | 1 |
| 1780 | 0 | 4 |
| 1790 | 0 | 1 |